

Northcentral Montana Cooperative Westslope Cutthroat Trout Restoration Project

2005 Annual Report

David Moser; Montana Dept. Fish Wildlife & Parks, Great Falls
Anne Tews; Montana Dept. Fish Wildlife & Parks, Lewistown
Michael Enk; United States Forest Service, Great Falls

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ABSTRACT

There has been little change in the total miles of stream in northcentral Montana which support pure WCT populations or number of pure populations since 2004 (132 miles and 56 populations in 2004 and 131 miles and 56 populations in 2005). In Belt Creek the number of miles of stream occupied by pure WCT decreased by one mile because of new information (proximity of hybrids and rainbow trout) on the pure population of WCT in Palisade Creek. In the Smith River Drainage, a new pure population of WCT was discovered in Lone Willow Creek (approximately 1.0 mile) and a previously considered pure population in French Creek was discovered to be introgressed with rainbow trout (approximately 1.5 miles). A new unprotected population of pure WCT was discovered in the headwaters of Weatherwax Creek (approximately 1.0 mile). This population is currently unprotected and will likely succumb to introgression in future years. No new efforts to translocate pure populations of WCT to previously fishless habitat were initiated in 2005. However, several ongoing translocation projects were undertaken in 2005 in the Smith, Sun, and Judith drainages. Drought and catastrophic events such as fire have the potential to rapidly negatively affect WCT numbers in northcentral Montana. In the absence of catastrophic events, restoration projects appear to be maintaining the current range of WCT in northcentral Montana despite small decreases in the range of pure WCT because of new genetic information and losses because of displacement by non-native fishes. In the future, larger projects which incorporate large drainage areas (>25 miles) will be necessary to significantly increase the current range of WCT and insure long term persistence (>100 years).

Accomplishments related to WCT restoration in the Upper Missouri Drainage included eradication of white suckers in Three Mile Creek Reservoir, and suppression of eastern brook trout (EB) in Cottonwood Creek. Accomplishments related to WCT restoration in the Smith River Drainage included netting (gill and trap net) surveys of Hound Creek Reservoir, Tyrell Creek, and Pole Creek for surviving non-native fishes (piscicide treatment in 2000), EB suppression in Jumping Creek and Daniels Creek. Habitat and barrier surveys of Big Camas Creek and Camas Lake, a genetic survey of Lone Willow Creek, macroinvertebrate surveys of South Fork Deep Creek, and a headwater transfer of pure WCT from Cottonwood Creek (Castle Mountains) to Mid Camas Creek (Big Belt Mountains). In the Sun River Drainage accomplishments included a post stocking (WCT) survey of Petty Creek for natural reproduction, a second new plant/transfer of WCT to a previously fishless area of North Fork Ford Creek, and a survey of fisheries habitat in Lange Creek. In the Belt Creek Drainage accomplishments included brook trout suppression in Middle Fork Little Belt Creek, relative abundance surveys of Dry Fork Drainage, Logging Creek, and Gold Run Creek, a headwater transfer of WCT in Gold Run Creek, population estimates at long term monitoring stations on Chamberlain Creek, disease sampling of O'Brien Creek, invertebrates sampling in Wilson Creek, and genetic sampling in Graveyard, Carpenter, and Lost creeks. In the Two-Medicine Drainage accomplishments included, a survey for presence of WCT in Railroad Creek. In the Arrow Creek Drainage accomplishments included, eradication/suppression of EB in Cottonwood Creek and collection of genetic samples from Boyd Creek. In the Judith River Drainage accomplishments included a transfer of genetically pure WCT from East Fork Big Spring Creek (Snowy Mountains) to North Fork Ford Creek (Rocky Mountain Front), a transfer of WCT from a tributary to West Fork Cottonwood Creek to previously fishless habitat in West Fork Cottonwood Creek (Snowy Mountains), WCT surveys of Stiner Creek, and population estimates in South Fork Judith River and North Fork Running Wolf Creek.

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INTRODUCTION

Westslope cutthroat trout (WCT) were first described by Lewis and Clark in 1805 near Great Falls, Montana. WCT are recognized as one of 14 interior subspecies of cutthroat trout and are found in Alberta, Idaho, Washington, and Montana. In Montana, WCT occupy the Upper Missouri River drainages east of the Continental Divide and the Upper Columbia Basin west of the divide (Behnke 1992). Although still widespread, WCT distribution and numbers have declined significantly in the past 100 years due to a variety of causes, including loss of habitat, competition and predation from non-native fish species, and hybridization (Shepard et al. 2003, Shepard et al. 1997, McIntyre and Rieman 1995, Liknes 1984, Hanzel 1959). Genetically unaltered WCT currently occupy approximately 8% of their historic habitat across their entire range (Shepard et al. 2003).

The marked decrease in WCT density and distribution led to them being listed in 1972 as a State Species of Special Concern by the Montana Department of Fish, Wildlife and Parks (MFWP). WCT were petitioned for listing as threatened under the federal Endangered Species Act in June 1997.

The state of Montana developed a statewide WCT Conservation Agreement in 1999 (updated document currently being drafted), with the help of a technical committee formed in 1994 and a steering committee formed in 1996. The Conservation Agreement was signed by several state and federal agencies as well as some non-government organizations. In 2000, a document was developed which described the status and restoration strategies (SRS) necessary for restoration of WCT in northcentral Montana (Tews et al. 2000). The strategies in the SRS were based on goals and objectives developed in the Conservation Agreement.

Strategies for restoration of WCT in northcentral Montana outlined in the 2000 SRS included: 1) preservation of all existing pure populations, 2) creation of two large populations (>50 miles of stream) as proposed in the conservation agreement, and 3) establishment of 2 to 4 additional secure viable populations (minimum of 2,500 individuals) each, in the Southern Tributaries and the East Front. Tools available to implement these strategies include, creation of new barriers to protect pure populations, removal or eradication of non-native species, and replication of existing pure populations in either empty headwater habitats or habitats made empty through application of piscicides.

In April of 2000, following an extensive status review, the U.S. Fish and Wildlife Service (USFWS) determined that westslope cutthroat trout were “not warranted” for federal listing. That finding was challenged in federal court, and the court remanded the not warranted finding back to the USFWS for additional review. In 2003, after additional review, the USFWS determined that WCT are not likely to become a threatened or endangered species in the foreseeable future, therefore listing was not warranted. The second finding of “not warranted” is again being challenged in federal court.

In 2001, a challenge cost share agreement was established between MFWP and the United States Forest Service (USFS). The agreement was formed to help implement new restoration efforts for WCT in northcentral Montana and coordinate existing efforts described in the SRS. The Wildlife Conservation and Restoration Program (WCRP) and the State Wildlife Grants (SWG) programs were established to provide states with federal aid funding to conserve declining fish and wildlife and their habitats. These programs provided funding in 2002, 2003, and 2004. PPL Montana provided funding for a fish and wildlife technician in 2003 and 2004. This report and much of the WCT restoration work it includes is a direct result of funding from these programs.

This report describes the status of WCT in northcentral Montana relative to the status of WCT in 2000 (SRS) and presents data on individual streams organized by fourth code HUC drainages (Hydrologic Unit Codes (HUC) are eight digit codes used to catalog watersheds).

STUDY AREA

The general study area includes the following major drainages: Arrow, Belt, Judith, Smith, Sun, Teton, Two Medicine, and Upper Missouri. These drainages are found within MFWP Region 4 and most WCT populations are located on National Forest Lands within Lewis and Clark and Helena National Forests (Figure 1).

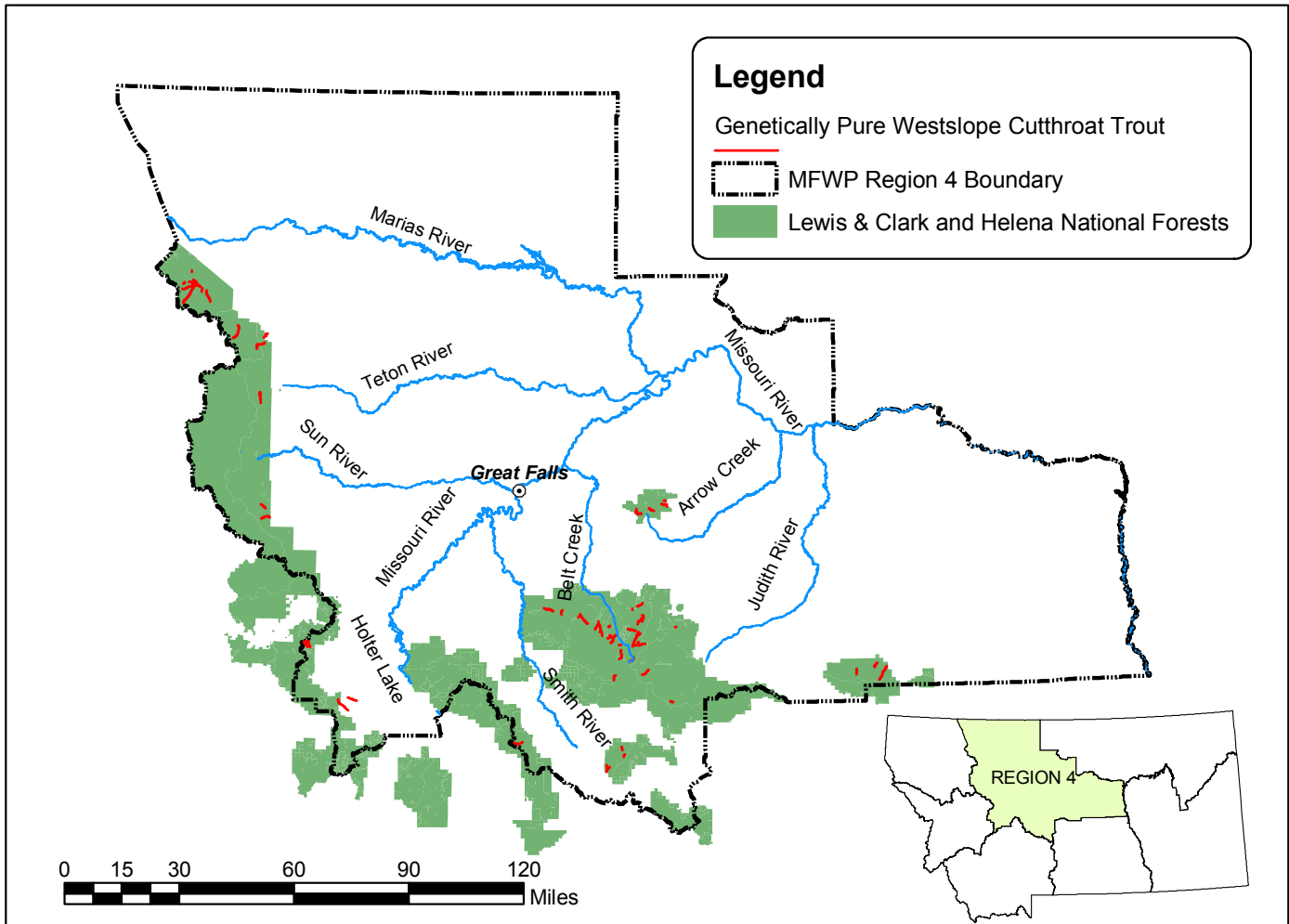


Figure 1. Study area in northcentral Montana with 100% pure WCT populations.

PROCEDURES

Fish populations were sampled Smith Root Model™ 12-A, 12-B, and LR-24 battery powered backpack electrofishing units. Population estimates followed the methods of Leathe (1983). On larger streams, such as the South Fork Judith River, two backpack units were used side by side to increase electrofishing efficiency. When the probability of capture during the second pass was less than 0.8, additional passes were usually made to reduce underestimates of trout population size as described by Riley and Fausch (1992). Small streams were electrofished in either an upstream direction with two block nets or downstream direction with a block net at the downstream end. Depletion estimates were calculated using Microfish 3.0 (Van Deventer and Platts 1985). Tissue from the caudal fins of trout were used for polymerase chain reaction (PCR) amplification of paired interspersed nuclear DNA elements (PINE) analysis and preserved in 95% ethanol. Adipose fins were clipped

on trout that were sampled for PINE genetics to prevent re-sampling the same fish during future surveys. For samples taken from Lost Fork Creek, whole trout were frozen for allozyme analysis. Fish were measured to the nearest 1 mm. On some streams, temperature was recorded every 1 - 2 hours with Onset continuous recording data loggers and is presented as average daily temperature (Appendix 1). Specific conductivity/TDS was measured with a temperature compensated Oakton TDSTestr3, TDSTestr1, or ECTestr with a range of 0 - 1990 $\mu\text{S}/\text{cm}$. Fish lengths, sampled stream lengths, and temperature are presented in metric. Other measures are presented in English units for clarity (e.g. miles of stream, cubic feet per second)

RESULTS AND DISCUSSION

Revision of WCT Distribution in North-Central Montana

Information within the 2000 SRS was used to guide restoration efforts over the last five years and provides a context with which to judge recent WCT restoration and protection efforts in northcentral Montana. It is important to stress that the purity and range of WCT populations described in the 2000 SRS was developed through professional judgment based on temporally and spatially limited sampling information. Moreover, estimated miles were in many cases developed by local biologists using maps and limited ground-truthing. The following results are presented as a rough estimate of WCT restoration progress in northcentral Montana since 2000 (baseline): it is not intended as a precise accounting of miles or purity. In addition, new genetic information may create the impression that miles of stream containing pure WCT trout are declining rapidly, when in reality, the populations may be stable or declining slowly. These decreases, in some cases, may be solely based on more accurate data (i.e. years 2000 to 2002; Figure 2).

There has been little change in the total miles of stream in northcentral Montana which support pure WCT populations or number of pure populations since 2004 (132 miles and 56 populations in 2004 and 131 miles and 56 populations in 2005; Table 1). In the Belt Creek Drainage, the number of miles of stream occupied by pure WCT decreased by one mile because of new field information which revealed the close proximity of hybrids and rainbow trout to WCT in Palisade Creek (Appendix 2). In the Smith River Drainage, a new pure population of WCT was discovered in Lone Willow Creek (approximately 1.0 mile) and a previously considered pure population in French Creek was discovered to be introgressed with rainbow trout (approximately 1.5 miles; Appendix 2). A new unprotected population of pure WCT was discovered in the headwaters of Weatherwax Creek (approximately 1.0 mile; Appendix 2). This population is currently unprotected and will likely succumb to introgression in future years. No new efforts to translocate pure populations of WCT to previously fishless habitat were initiated in 2005. However, several ongoing translocation projects continued in 2005 in the Smith, Sun, and Judith drainages. Drought and catastrophic events such as fire have the potential to rapidly negatively affect WCT numbers in northcentral Montana. In the absence of catastrophic events, restoration projects appear to be maintaining the current range of WCT in northcentral Montana despite small decreases in the range of pure WCT because of new genetic information and losses because of displacement by non-native fishes. In the future, larger projects which incorporate large drainage areas (>25 miles) will be necessary to significantly increase the current range of WCT and insure long term persistence (>100 years).

Most of the major changes in status of local populations in 2005 (both pure and less than pure populations of WCT) are described and listed in Appendix 4, these include: changes in stream miles because of new distribution data (field observations), changes in stream miles because of new genetic data, and newly discovered pure populations. In addition, more textual detail organized by drainage is provided in the summary of survey and restoration efforts forthwith.

Table 1. Distribution of WCT, rainbow trout and brook trout (stream miles) in northcentral Montana. Number of populations in parentheses (Tews et. al 2000; updated January 2005).

Drainage	Estimate d miles of suitable historic habitat for WCT ¹	% of historic habitat occupied by genetically pure WCT	Miles of stream occupied by genetically pure WCT (# of pops.) ²		Miles of stream occupied by 90-99.9% pure WCT (# of pops.) ²		Miles of stream occupied by less than 90% pure WCT (# of pops.) ³		Miles of stream occupied by brook trout ⁴	Miles of stream occupie d by rainbow trout ⁴	Total stream miles in drainag e ⁵
Upper Missouri	1,199	1%	12	(4)	3	(1)	16	(4)	802	992	2,200
Shonkin	21	0%							21	14	
Highwood	55	4%	2	(1)			1	(1)	55	44	
Smith	741	2%	17	(9)	24	(8)	37	(10)	691	516	2,858
Sun	365	1%	5	(2)	9	(5)	5	(1)	362	461	2,404
Belt	249	15%	36	(18)	62	(17)	8	(5)	211	197	800
Teton	335	2%	6	(3)	25	(9)			329	194	1,751
Two Medicine	267	14%	37	(10)	39	(13)	12	(4)	240	194	1,422
Cutbank Cr.	23	0%							0	23	1,089
Marias	150	0%							0	150	2,494
Arrow	47	6%	3	(2)					47	34	1,336
Judith	480	2%	8	(5)	51	(18)	17	(7)	304	409	3,223
Upper Musselshell									262	198	4,676
Box Elder	94	2%	2	(1)					0	94	891
Flatwillow	122	4%	5	(1)					122	98	1,372
Total Region 4	4,148	3%	131	(56)	212	(71)	96	(32)	3,446	3,618	26,516
Total Region 4 (2000 SRS)	4,148	5%	194	(72)	168	(43)	66	(20)	3,446	3,618	26,516

¹ suitable habitat based on current rainbow and brook trout distribution in the historical WCT range (Steve Carson, MFWP, Montana Rivers Information System)

² calculated from USFS and MFWP data files. Number of populations may vary slightly due to questions about where one population ends and another begins; updated 2003.

³ genetically tested populations, 100's of more miles likely exist that are hybridized but have not been tested;

⁴ miles from Montana Rivers Information System (Steve Carson, MFWP) and includes areas that were likely not historic habitat

⁵ total drainage miles from Conservation Agreement (MFWP 1999), this number includes stream reaches that have not been surveyed, including areas that will not support trout

* Miles of stream occupied by brook trout have decreased slightly in three drainages where barriers have been built and electrofishing has been used as a tool for eradication. Streams where EB have been removed completely or substantially depressed: Big Coulee (≈2 miles; Highwood), Cottonwood Creek (≈2 miles; Arrow), and Chamberlain Creek (≈1 mile; Belt).

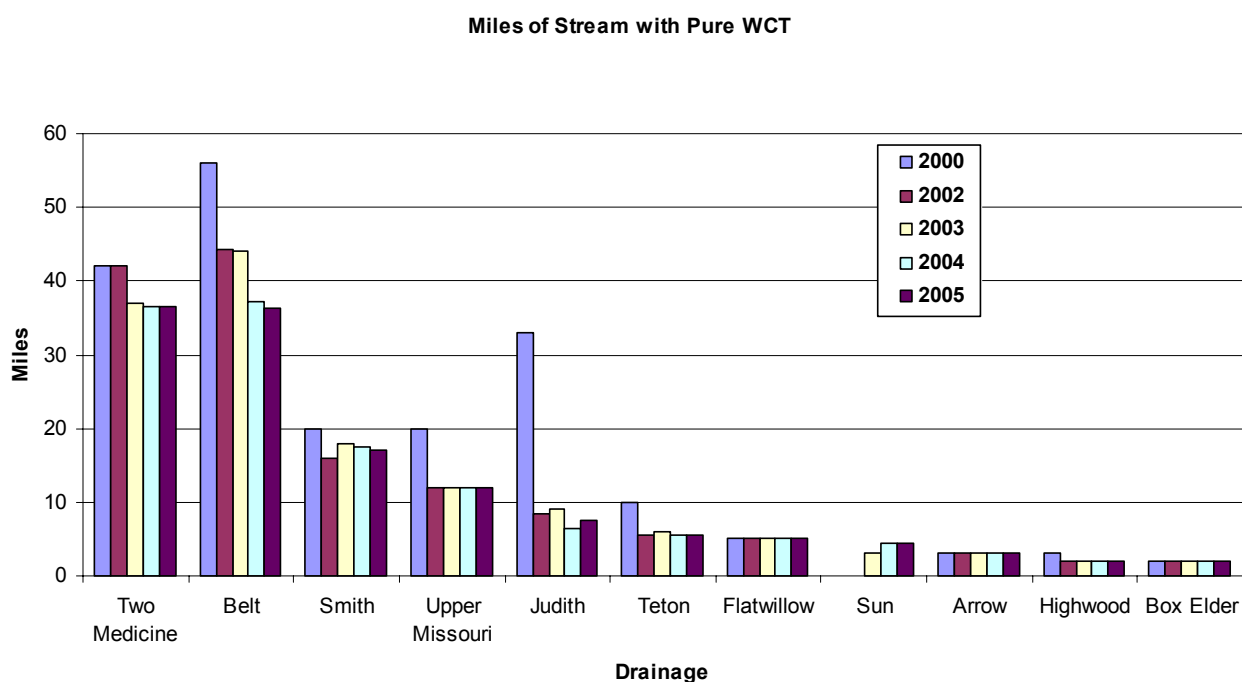


Figure 2. Miles of stream in large drainage basins (4th Code HUICS) with pure WCT from 2000 to 2005.

Restoration Projects, 2005

The following tables and text present the details of recovery efforts during 2005. Specifics related to restoration efforts and biological monitoring from 1999 to 2001 have been presented in MFWP annual coldwater reports (Tews et al. 1999; 2000; 2001). Specifics related to restoration and biological monitoring from 2002 to 2004 have been presented in MFWP northcentral Montana WCT reports (Moser et al. 2002; 2003; 2004)

In general, restoration efforts involve use of the following methodologies: 1) creation of fish barriers, 2) brook trout suppression/eradication, and 3) WCT transfers (replication or expansion opportunities). These methodologies were outlined in the 2000 SRS (Tews et al. 2000) as well as the 1999 Memorandum of Understanding and Conservation Agreement (MFWP 1999). Specifically, these efforts focus on protecting existing pure populations through creation of barriers to upstream movement of non-native fishes, maintaining status quo of populations by suppression of non-native fishes (generally temporary measures), and increasing the range of pure populations through transfer to headwater habitats devoid of fishes or into habitats where non-native fish have been removed by use of piscicides. A decision was made not to suppress non-native brook trout in streams where WCT have introgressed (90-99%) with rainbow trout (unless special circumstances warrant removal; e.g. it is the last population in a large basin). This decision was made necessary because of limited resources and the presence of numerous populations of pure cutthroat threatened by non-native fishes. If additional resources become available, efforts to suppress brook trout in nearly pure populations of WCT may be initiated.

In addition to the aforementioned restoration efforts, collection of baseline and monitoring information is integral to evaluation of success of projects and modification of future restoration methodologies. Information collected in 2005 included: 1) fish abundance and biomass, 2) instream habitat quality and quantity, 3) stream

temperature and conductivity, 3) invertebrate samples, amphibian surveys, and fish disease collections (for transfers), and 4) fish population genetic samples.

Summary of Survey and Restoration Efforts by Drainage

Statistics of fish sampled during 2005 are listed in Appendix 5. Streams were sampled by USFS and MFWP crews. Genetic test results from prior years sampling were received from 19 streams (Appendix 6). In 2005, MFWP and USFS personnel took tissue from *Oncorhynchus* sp. for genetic testing on 14 streams region-wide (Appendix 7). Information on specific conductance and stream temperature was collected at most fish sampling locations (Appendix 8). Water temperature may play an important role in persistence of WCT populations in Rocky Mountain streams. Low mean summer water temperatures have been linked to poor persistence of allopatric populations of WCT (Harig and Fausch 2002; Coleman and Fausch 2004). In addition, populations of WCT relegated to high elevation stream reaches by downstream competition with brook trout may also show poor survival and persistence and may also likely decline (Peterson et al. 2004).

Shepard (2004) posited that other abiotic factors such as woody debris, pool frequencies, and fine sediments (all potentially modified by land use practices) may influence brook trout invasion and displacement of WCT. Time constraints have precluded measurement of abiotic factors other than temperature and maximum pool depths during reconnaissance of potential new habitats for transfer of WCT. An assumption (these authors) has been made that in most cases - with the exception of extremely low temperatures - WCT will thrive in most habitats free of competitive interaction with non-native brook trout.

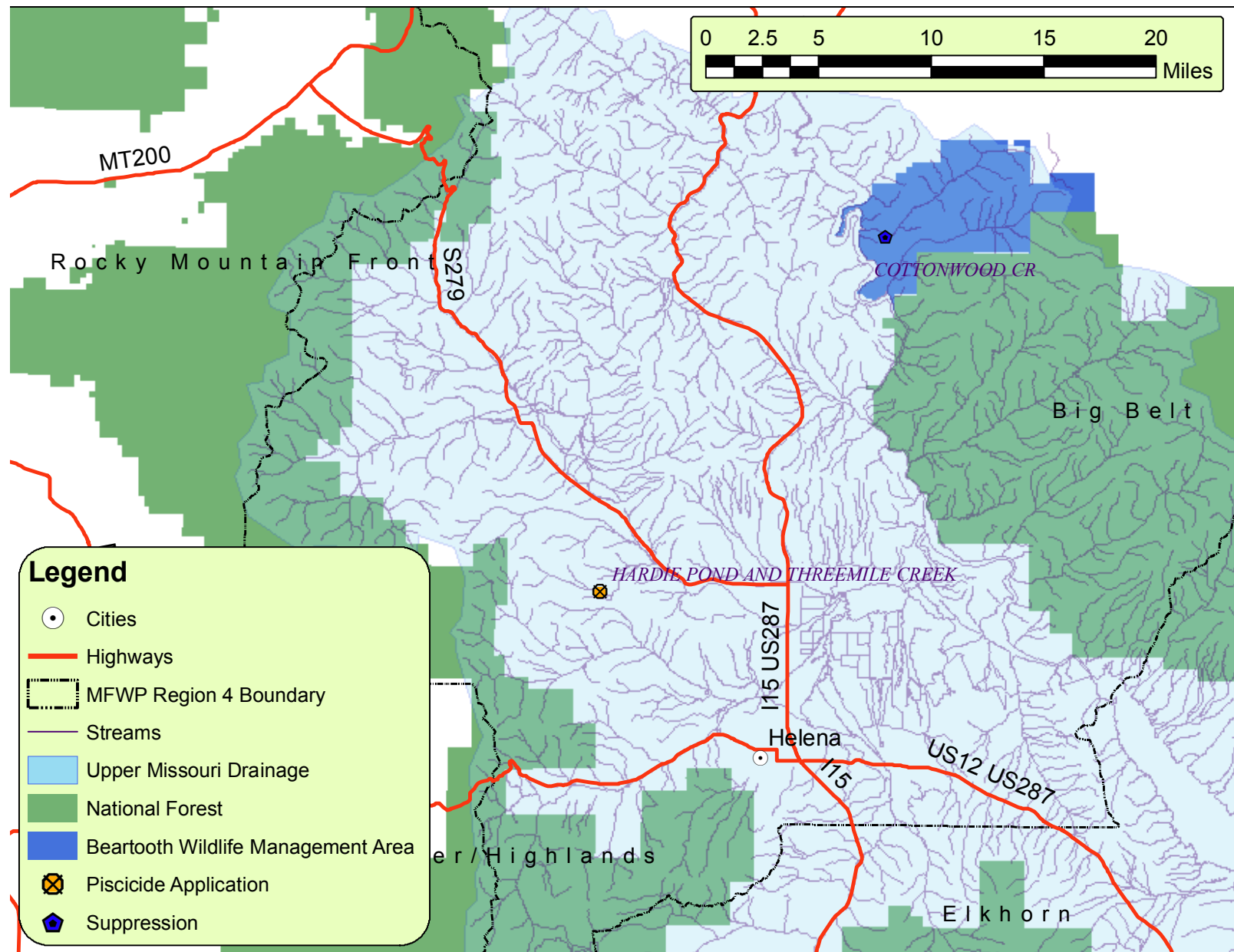


Figure 3. Upper Missouri Drainage location and sampling sites, 2005. White Suckers were eradicated in Hardie Pond and EB were suppressed in Cottonwood Creek.

Upper Missouri Drainage (4th Code HUC 10030101)

Accomplishments related to WCT restoration in the Upper Missouri Drainage included eradication of white suckers in Hardie Pond, and suppression of eastern brook trout (EB) in Cottonwood Creek.

Three-Mile Creek Three Mile Creek and its reservoir, Hardie Pond, held a robust WCT fishery until recent stocking of white suckers (*Catostomus commersoni*) by an unknown party. From 2004 to 2005, 45,779 white suckers were removed from Hardie Pond over 352 trap net nights. In 2004, mark recapture estimates indicated the Hardie Pond held approximately 141 WCT (85 to 405). In 2005, white suckers were eradicated from Three Mile Creek and its reservoir using rotenone (Figure 3). Forty-two WCT were transferred from Hardie Pond to Fosket Pond prior to treatment. Thirty-one of the transferred fish were moved back to Hardie Pond following treatment. The first half mile of Three Mile Creek was electrofished in 2005 prior to treatment of Hardie Pond. Forty-Four WCT were captured during this one pass survey. An additional 2.5 miles of Three Mile Creek is habitable and if occupied by WCT increases the total estimated population (post treatment) to approximately 200 to 250 individuals.

Cottonwood Creek Attempts were made on several occasions in 2005 to remove remaining EB which survived the piscicide treatment of Cottonwood Creek in 2003 (Figure 3). Several EB were found in spring/seep areas that likely provided refugia from fish toxicant during treatment. Additional suppression and/or piscicide treatment is planned for 2006.

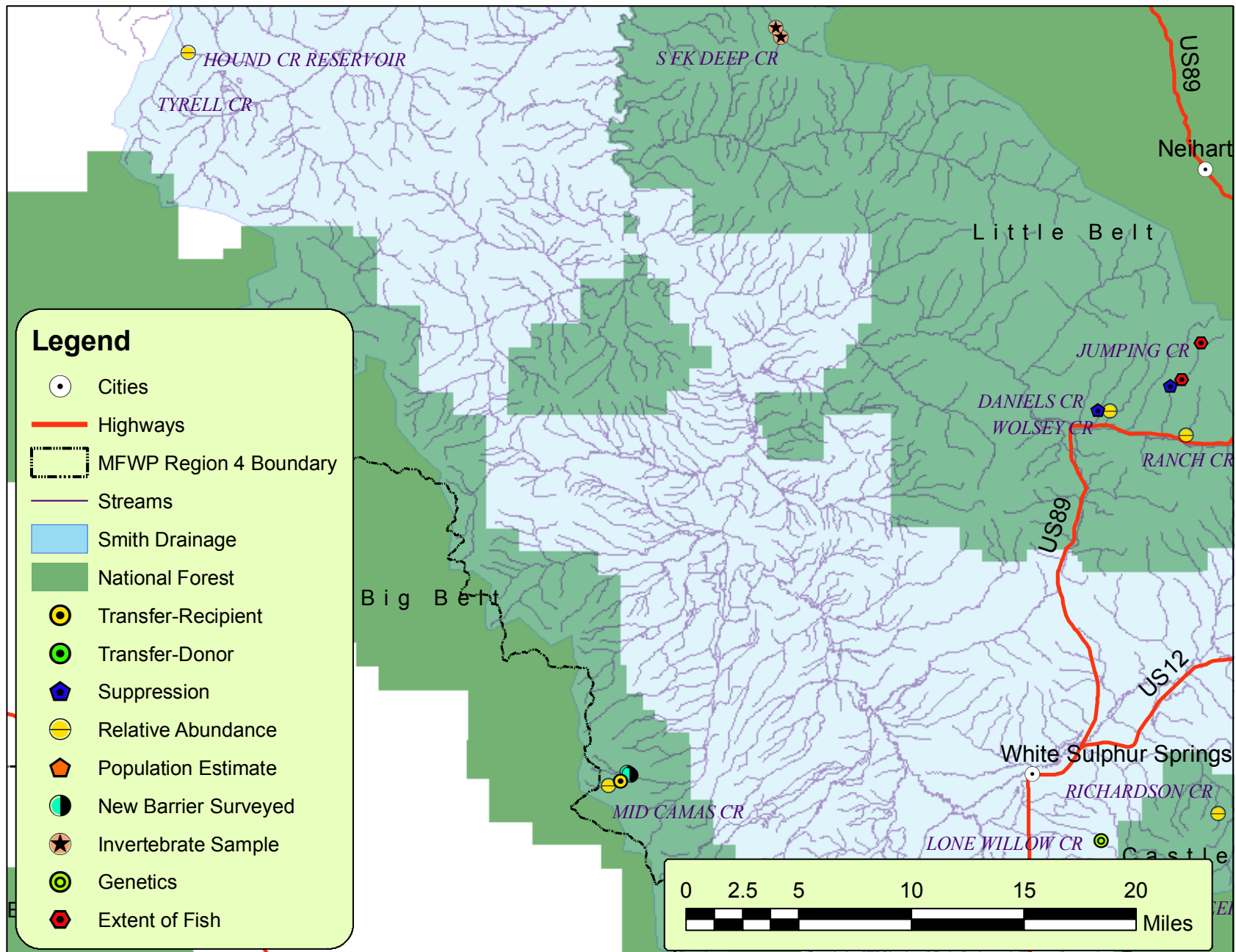


Figure 4. Smith Drainage location and sampling sites, 2005.

Smith River (4th Code HUC 10030103)

Accomplishments related to WCT restoration in the Smith River Drainage included netting (gill and trap net) surveys of Hound Creek Reservoir, Tyrell Creek, and Pole Creek for surviving non-native fishes (piscicide treatment in 2000), EB suppression in Jumping Creek and Daniels Creek. Habitat and barrier surveys of Big Camas Creek and Camas Lake, a genetic survey of Lone Willow Creek, macroinvertebrate surveys of South Fork Deep Creek, and a headwater transfer of pure WCT from Cottonwood Creek (Castle Mountains) to Mid Camas Creek (Big Belt Mountains).

Big Camas Creek and Camas Lake On 3 and 4th of August 2005, Upper Big Camas Creek and Camas Lake were surveyed for barriers and habitat quality. Currently, Camas Lake holds a naturally reproducing population of Yellowstone cutthroat trout (YCT; *Oncorhynchus clarkii bouvieri*). In addition, a horizontal gill net (experimental net - gradation of mesh sizes) was placed in Camas Lake overnight. Fish captured in the gill net and using hook and line equipment averaged ten inches in total length. Downstream of the Camas Lake outlet, Big Camas Creek gradient was high and the stream a number of good plunge pools inhabited by YCT. Immediately upstream of its confluence with Mid Camas Creek a series of three falls barriers were surveyed (Figure 4). A small tributary at the headwaters of the drainage upstream of Camas Lake had adequate spawning gravels but a small number of holding areas for fish during low water. Overall, habitat in the Big Camas Creek Drainage is fragmented by numerous barriers but interspersed with excellent fish habitat in reaches from 0.5 to 1.5 miles in length (including the Mid Camas headwater transfer site). This drainage may warrant future WCT restoration using piscicides. Treatment with piscicides would be relatively simple and could be completed in phases because of the presence of barriers at regular intervals.

Daniels Creek On 29 September 2005, EB were suppressed in the lower reaches of Daniels Creek. Thirty hybrids (rainbow trout X westslope cutthroat trout) and 16 brook trout were captured in 670 meters of stream. The headwaters of Daniels Creek currently hold genetically pure WCT (Appendix 4; Leary 2005). There is no barrier between hybridized fish in the lower reaches of Daniels Creek and pure fish in the headwaters. An enclosure fence was constructed by USFS personnel on Daniels Creek in 2005. The fence protects approximately XX miles of stream from the negative impacts of livestock grazing.

Geis Creek, North Fork Smith River The former Dunkel Ranch (now Smith River Wilderness Ranch) near the headwaters of the North Fork Smith River was recently sold and the new landowners, through a private consultant (Scott Gillilan), expressed an interest in WCT restoration on their property (Moser et al. 2004). A field visit was arranged for 29 September 2004 during which David Moser and Brad Shepard toured the ranch with Scott Gillilan. During the field visit two potential projects were discussed. The first project would involve the restoration of WCT in Geis Creek. The lower portions of Geis Creek are located on the Wilderness Ranch and the uppermost portions are on national forest land and small parcels of private land. The other project would involve stocking of hatchery WCT in the headwaters of the North Fork of Smith River. The purpose of the stocking is to potentially create a more robust fishery and monitor the success of hatchery WCT living in sympatry with EB in the relatively cold temperature regime of upper North Fork Smith. Preliminary surveys were never completed in either Geis Creek or the North Fork of the Smith River because project biologists had trouble coordinating survey times with landowners. If these projects are to go forward a Memorandum of Understanding will need to be developed which allows project participant's access to project reaches when necessary. A thermograph (Onset Stowaway ®) was placed in the lower reach of Geis Creek revealed summer water temperature may be lower (Average August Temp. 7.06 C; Appendix 1) than necessary (Harig and Fausch 2002) to maintain a long-term WCT fishery. Further evaluations of the extent and quality of stream habitat will be necessary before future fish translocations are attempted.

Jumping Creek In 2004, genetics surveys indicated Jumping Creek supported a small extant population of pure WCT (Moser 2004). In 2005, brook trout were suppressed over 4 km of stream (Figure 4; Figure 5; and Appendix 5). Five hundred and sixty-eight EB were suppressed from 13 July to 1 August 2005. A total of 76 WCT were captured during suppression efforts (Figure 5; average length 136 mm; range from 61 to 215 mm). There are no rainbow trout or hybrids in the lower reaches of Jumping Creek. Sheep Creek downstream of the Highway 89 culvert supports rainbow trout and brook trout. The culvert was measured to be 61' 5" length x 4' diameter and velocity was estimated to be approximately seven feet per second at base flow (using timed floating object). Additional, more precise surveys of culvert gradient will allow calculations of channel velocity at all flows, and will help in estimating the efficacy of the culvert as a barrier. In addition, EB will be captured, marked, and moved downstream of the barrier in 2006. If it is determined that the culvert is a fish barrier at all flows then options for restoration of the drainage's WCT population will be pursued (i.e. piscicide or electrofishing rehabilitation projects).

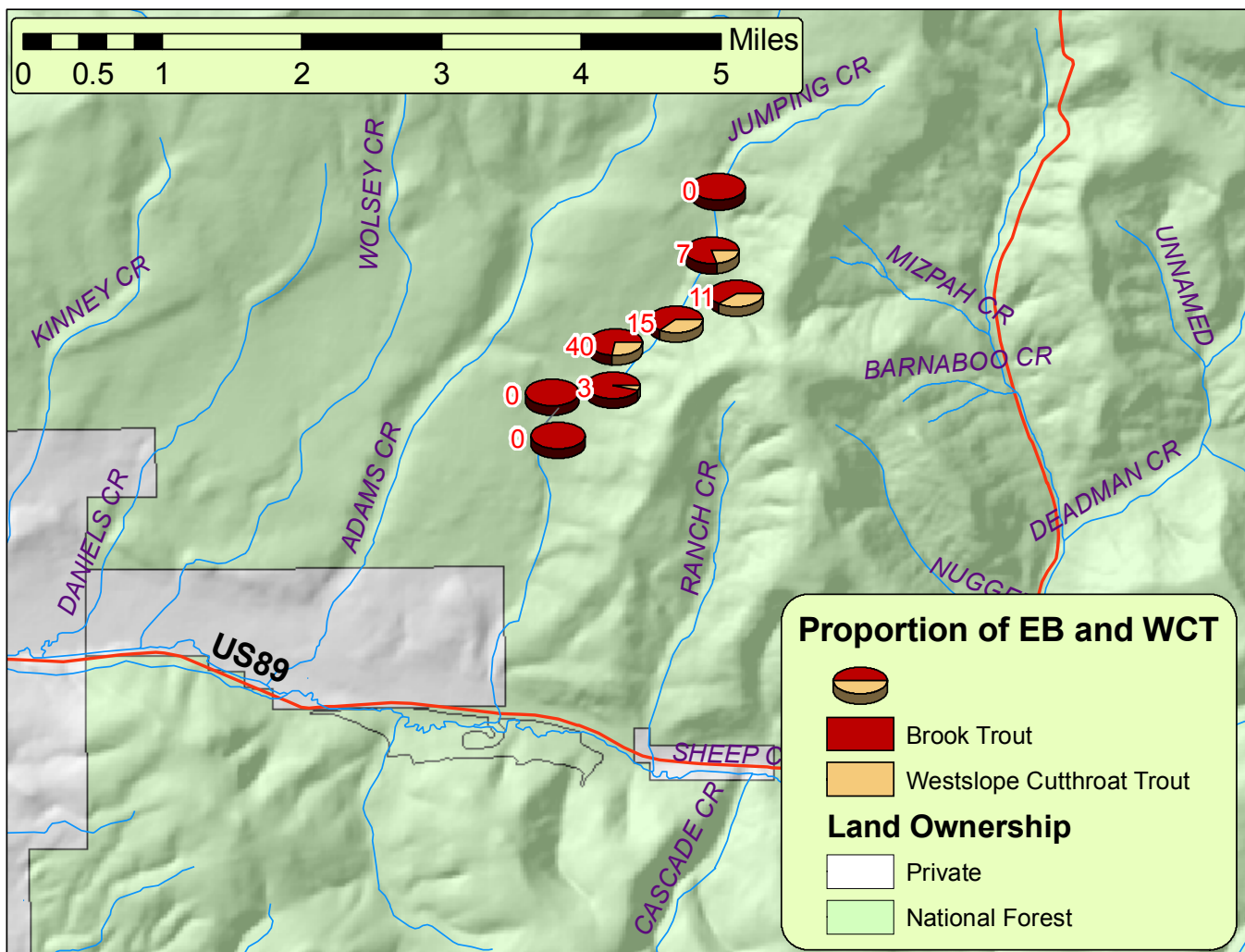


Figure 5. Distribution and proportion of WCT and EB along Jumping Creek (Smith Drainage). Numbers in red are total WCT catch during suppression efforts, 2005.

Lone Willow Creek On 11 October 2005, genetic samples (PINE) were collected from 28 fish in Lone Willow Creek upstream of an irrigation reservoir (Figure 4; Appendix 5; Appendix 7). Genetic analysis indicated that the Lone Willow Creek population is pure (Appendix 5; Leary 2005). Lone Willow Creek is a small stream draining the western slope of the Castle Mountains, the majority which is on private property. Additional surveys will be completed in 2006 to assess the distribution and abundance of WCT along the length of Lone Willow Creek. This information will be vital in determining whether enough fish exist in the population for potential future transfers to empty habitats. In addition, another 25 genetic samples will need to be collected to confirm purity of this population (99% chance of detecting 1% rainbow introgression). All future surveys and transfers are contingent upon landowner consent.

Mid Camas Creek On 12 July 2005, Mid Camas Creek was electrofished from its confluence with Big Camas Creek to a point just upstream of the area fish were planted in 2003. Eight fish were seen but not captured during the electrofishing pass. Low conductivities and high water reduced electrofishing capture efficiencies. Seven fish appeared to be holdovers from the original transfer and one fish was small enough to be natural reproduction from the transfer in 2003. On 14 September 2005, 37 pure WCT were transferred from West Fork Cottonwood Creek (see above) to buoy the new population and prevent founder effects (inbreeding depression). A thermograph (Onset Stowaway ®) was retrieved from Mid Camas Creek on 12 July 2005 (Figure 4; Appendix 1). Average August temperatures (10.5 C; Appendix 1) in Mid Camas Creek are well above those deemed to be too low to support populations over most years (Harig and Fausch 2002; Coleman and Fausch 2004). One additional transfer may be completed in 2006. Future transfers will be predicated on the health/robustness of the WCT population in West Fork Cottonwood Creek.

Ranch Creek and Wolsey Creek On 5 July 2005, Ranch Creek was spot shocked for presence of WCT (Figure 4; Appendix 5). No WCT were observed. The remainder of captured fish were EB that ranged from 125 to 185 mm (8 fish). Wolsey Creek was shocked on 22 September 2005. Forty-six EB were captured ranging from 55 to 243 mm.

Richardson Creek On 22 July 2005, Richardson Creek was spot shocked within a livestock enclosure fence. Nine fish were captured ranging from 74 to 194 mm in length. The Richardson Creek population is very small and likely very near carrying capacity.

South Fork Deep Creek On 12 September 2005, macroinvertebrate samples were collected from the South Fork of Deep Creek in the Little Belt Mountains (Figure 4). D-Frame kick-net samples were collected from a diverse array of habitats above and below a fish barrier. Samples were collected to investigate whether any rare species of stream invertebrate would be threatened by a transfer of WCT into the fishless portion of South Fork Deep Creek above the barrier. The fishless habitat upstream of the barrier is approximately 0.75 miles in length. Though length is limited, habitat upstream of the barrier is of excellent quality and may provide ample resources for a small population of WCT. The kick-net samples were delivered to Dr. Daniel Gustafson of Montana State University for analysis. A fish disease survey and amphibian survey will also need to be completed before fish are transferred into this new habitat.

Tyrell Creek, Pole Creek and Hound Creek Reservoir In 2000, upper Hound Creek Reservoir and its tributaries (Tyrell and Pole creeks) were treated with rotenone to remove non-native fishes (Figure 4). In 2001, several EB were found and removed from Tyrell Creek directly upstream of the reservoir. In 2002, 2003, and 2004, no non-native fishes were found in Tyrell Creek using electrofishing equipment or Hound Creek Reservoir through the use of trap nets and gill nets. The majority of Tyrell Creek was electrofished on five occasions from 9 June to 23 June 2004. No fish other than *Cottus* sp. were encountered during electrofishing efforts and during snorkeling of lower beaver ponds in 2004. In addition, the lower reaches of Pole Creek were electrofished in 2004. Ten EB were found in approximately 1,000 meters of stream. Fish averaged 215 mm in length (range 190 to 250 mm).

Two small mesh trap nets were placed in Hound Creek Reservoir from 26 May to 21 June 2005. No fish other than stocked grayling (*Thymallus* sp.) were caught in trap nets. In addition, a gill net was placed overnight on three occasions, 26 May, 31 May, and 14 June. Eighteen grayling were caught in the gill nets. Fish averaged 388 mm in length and 672 g in weight (range 351 to 422 mm; average W_R 124; Reed and McCann 1971). A single large brook trout was caught in the gill net set on 14 June (337 mm and 549 g). Minnow traps were placed in Pole Creek (26 May, 31 May, and 14 June) and Tyrell Creek (26 May and 31 May) during spring runoff to detect any out-migration of EB from potential spawns of fish missed during piscicide treatment. No fish were caught in any of the minnow trap sets. Pending a signed Candidate Conservation Agreement with Assurances, Tyrell Creek, Pole Creek and Hound Creek Reservoir will be treated with rotenone and/or antimycin. An EA for piscicide treatment was completed in 2004.

West Fork Cottonwood Creek On 14 September 2005, 44 sub-adult and adult WCT (average length 150 mm; range from 73 to 245 mm) were captured in Cottonwood Creek in the Castle Mountains and moved by truck and backpack to a section of Mid Camas Creek in the Big Belt Mountains (Figure 4; Table 2; Appendix 5). In addition, approximately 40 age-0 WCT were transferred with the 44 sub-adults and adults. During transfer most (approximately 30) age-0 fish were eaten by larger fish. In future, age-0 fish will be segregated during transfers. This was the second time fish from Cottonwood Creek were transferred to Mid Camas Creek; in 2003 80 fish were also transferred to this reach by truck and backpack.

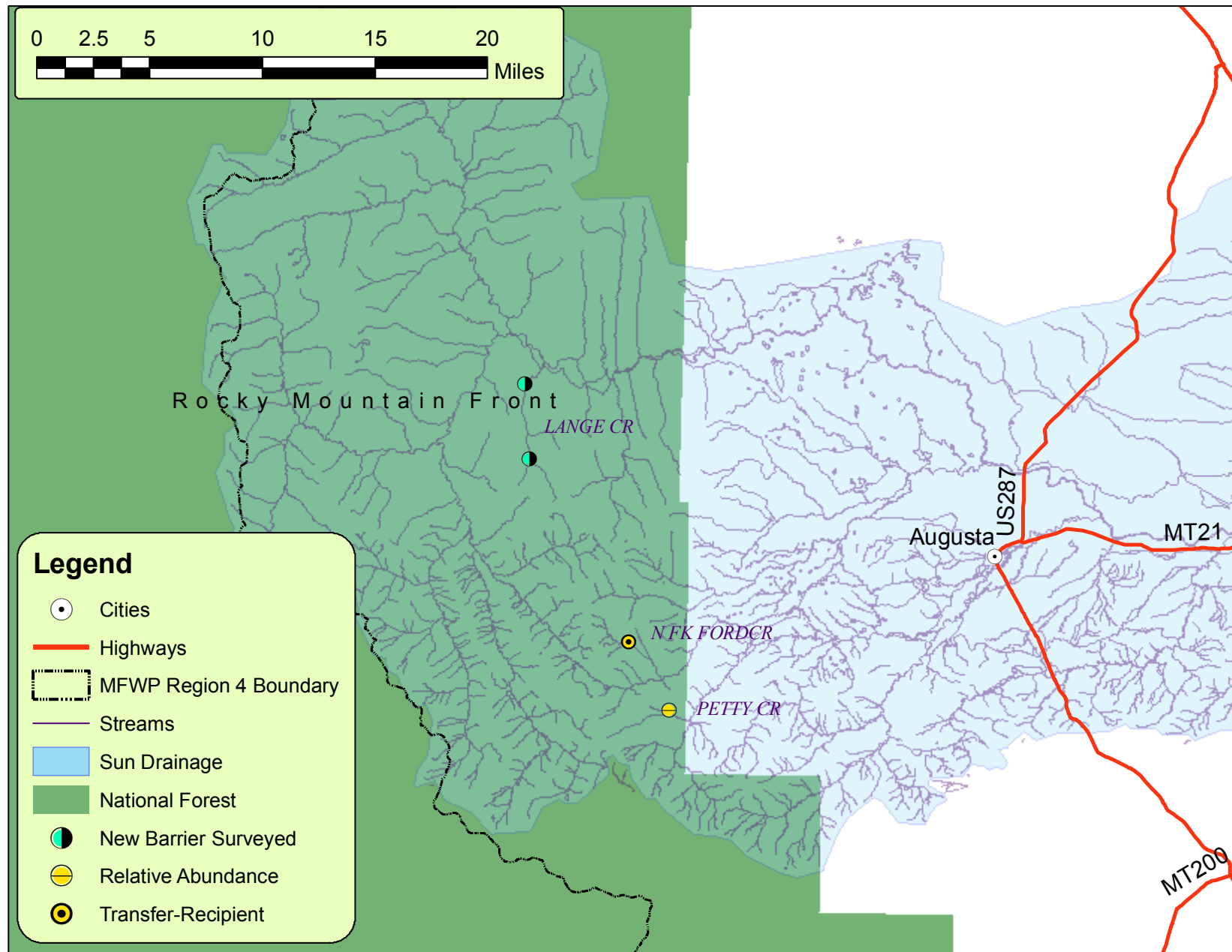


Figure 6. Sun Drainage location and sampling sites, 2005. WCT were transferred from E. Fk. Spring Creek (see Judith Drainage) to N. Fk. Ford Creek.

Sun Drainage (4th Code HUC 10030104)

Accomplishments related to WCT restoration in the Sun River Drainage included a post stocking (WCT) survey of Petty Creek for natural reproduction, a second new plant/transfer of WCT to a previously fishless area of North Fork Ford Creek, and a survey of fisheries habitat in Lange Creek.

Lange Creek From 18 to 19 July 2005, Lange Creek was surveyed for the presence of fish, quality of habitat, and fish barriers (Figure 6). No fish were observed anywhere in Lange Creek upstream of a significant (>100 ft.) falls barrier near the mouth at Gibson Reservoir. The entire stream channel was walked in a downstream direction from a fish barrier located midway in the drainage (Latitude 47.54942 °N Longitude 112.835 °W) to the barrier at the mouth (Latitude 47.6024 °N Longitude 112.8349 °W). Habitat in this 2.5 mile section of stream is good with numerous over-wintering pools, adequate instream woody debris, and adequate secondary productivity (judged qualitatively). Average August temperatures (11.78 C; Appendix 1) in Lange Creek are well above temperatures deemed to be too low to support populations over most years (Harig and Fausch 2002; Coleman and Fausch 2004). However, much of the stream and its spawning substrates are heavily embedded with glacially derived silt. This reach of stream may have limited amounts of adequate spawning gravels, but would likely support a transferred population of WCT for many years. In 2006, invertebrate samples will be collected above the most downstream barrier to determine if any rare species would be threatened by translocation of WCT. Plans for a translocation and NEPA will be completed during winter of 2006 and transfers may commence in 2007.

North Fork Ford Creek On 8 August 2005, 100 WCT ranging from 63 to 242 mm total length (average 156 mm) were moved from East Fork Big Spring Creek (Snowy Mountains; Judith Drainage) to a previously fishless (before 2004) section of North Fork Ford Creek above a barrier waterfall (Figure 6; Appendix 5). In 2004, 109 fish were moved into this reach of North Fork Ford Creek from East Fork Big Spring Creek. If successful, this replicated population will occupy approximately 1.5 miles of stream. The crew responsible for transferring the fish from the helicopter to the stream observed numerous holdovers from the 2004 plant in pools near the drop site. This will likely be the last transfer of fish until it can be ascertained (2008 and beyond) whether the plant was successful and a robust, naturally reproducing population occupies the drainage. The minimum recommended number of randomly paired, unrelated spawners required to prevent founder effects is 25 females and 25 males (Leary et al. 1998). The total number (209) of fish transferred in 2004 and 2005 should be adequate to ensure the future genetic health of this population. In a real world setting, some transferred fish are likely to be siblings, not all transferred fish will survive overwinter, and not all transferred fish will spawn. Sex ratios will likely be close to 50/50 assuming electrofishing gear is not sex selective and males and females use the same stream habitat at the scale of 100 to 200 meters. In both 2004 and 2005, genetic samples (Moser et al. 2004; 2005; Appendix 7) were collected from all transferred fish. Brad Shepard of MFWP is coordinating with geneticists to monitor success of fish transfers by looking at the outcomes of transfers of single populations, combined populations, and hatchery populations. Using modern genetic techniques, the genetic contribution of individual fish to new populations can be determined.

Petty Creek On 25 August 2005, Petty Creek was surveyed near the fish transfer release sites of 2002 and 2003 (Figure 6). Sixteen fish were collected in approximately 170 m of stream immediately downstream of the plant site. Fish ranged in size from 55 to 239 mm (average 149 mm; Figure 7; Appendix 5). Half the captured fish were holdovers from fish plants in 2002 and 2003. The remainder of captured fish represent natural reproduction, likely age-1, age-2, and age-3 individuals. Fish lengths in Petty Creek are less than the size found in other streams with warmer summer water temperatures. The average August temperature in Petty is 5.6 C (measured in 2002). Typical August stream temperatures in other streams in northcentral Montana that support robust populations of WCT are between 8.0 and 10.0 C. Several recent studies (Harig and Fausch 2002; Coleman and Fausch 2004) have suggested that low summer water temperatures cause recruitment bottlenecks

in some streams because of developmental delay of age-0 fish and a resulting low overwinter survival rates. Harig and Fausch (2002) posit that in the case of Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*), in streams with average July temperatures below 7.8 C, translocated populations will not have successful reproduction and recruitment over most years. Whether this will hold for WCT in northcentral Montana and Petty Creek in particular is unknown.

Petty Creek (Sun Drainage)

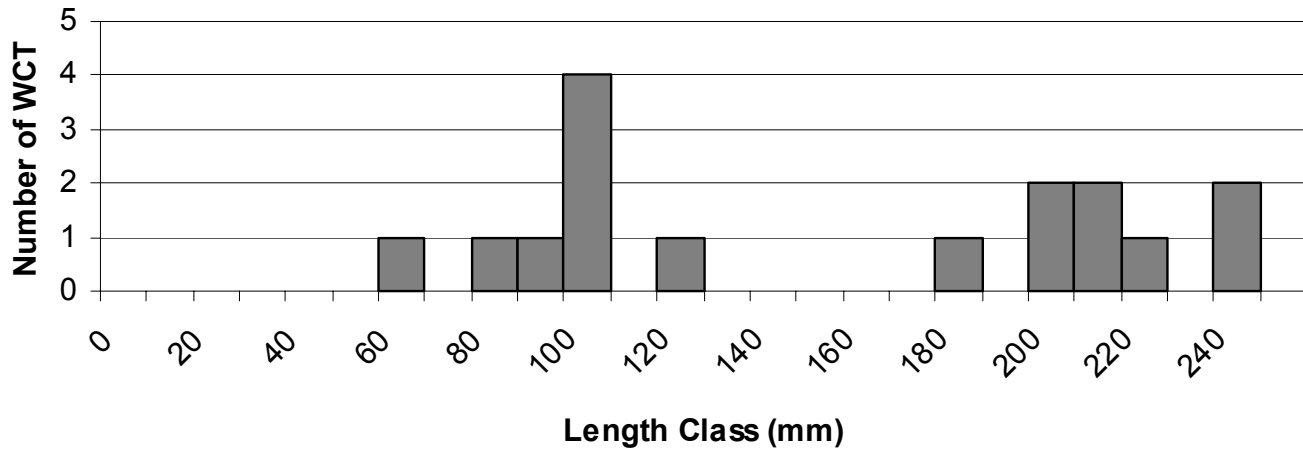


Figure 7. Length frequency of WCT captured in 170 m of Petty Creek (Sun Drainage), 2005.

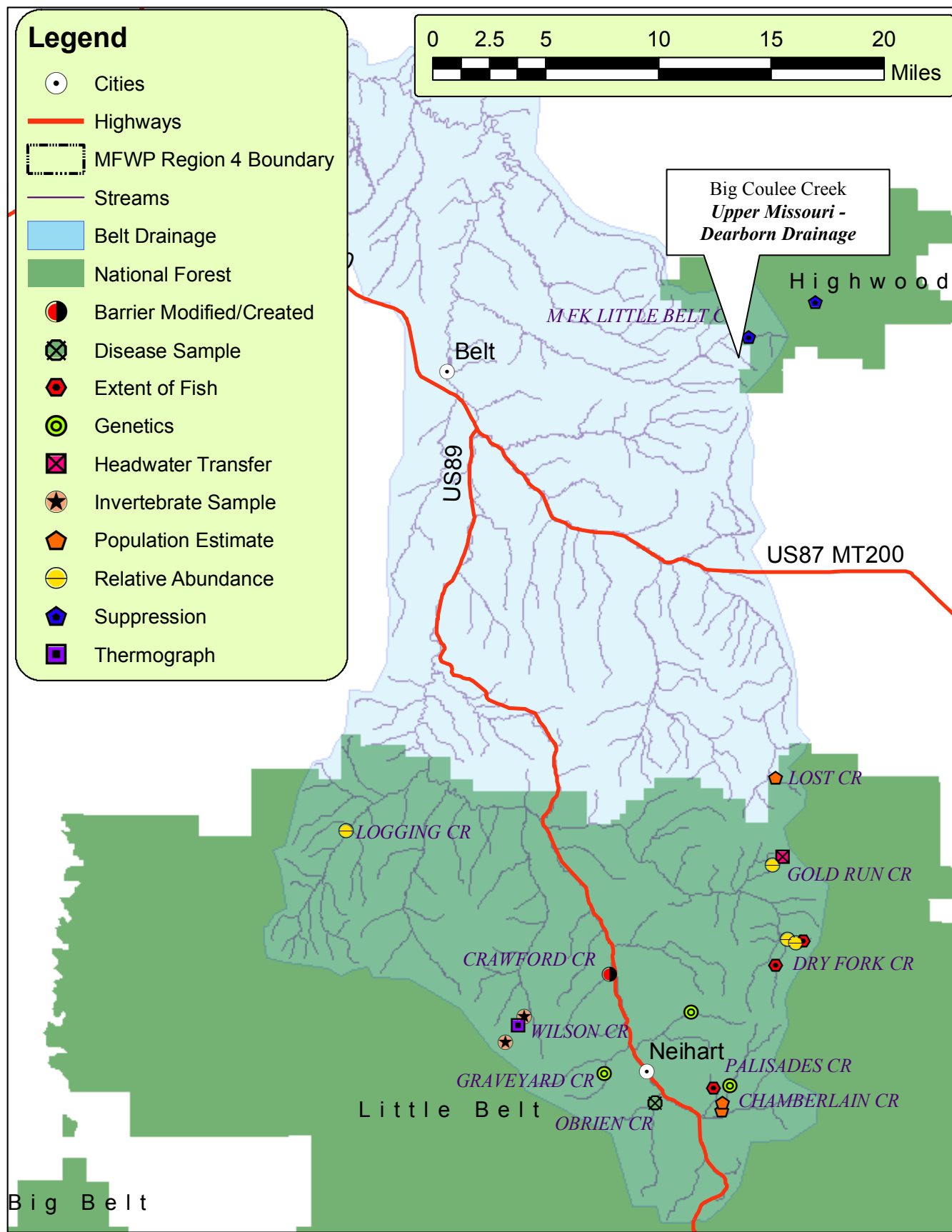


Figure 8. Belt Drainage location and sampling sites, 2005. Brook trout were suppressed in Middle Fork Little Belt and Big Coulee creeks.

Belt Creek (4th Code HUC 10030105) and Upper Mo. - Dearborn Drainages (4th Code HUC 10030102)

Accomplishments related to WCT restoration in the Belt Creek Drainage included brook trout suppression in Middle Fork Little Belt Creek, relative abundance surveys of Dry Fork Drainage, Logging Creek, and Gold Run Creek, a headwater transfer of WCT in Gold Run Creek, population estimates at long term monitoring stations on Chamberlain Creek, disease sampling of O'Brien Creek, invertebrates sampling in Wilson Creek, and genetic sampling in Graveyard, Carpenter, and Lost creeks.

Big Coulee Creek (Upper Missouri - Dearborn Drainage (4th Code HUC 10030102) Brook trout were suppressed above a waterfall barrier from 12 July to 15 August 2005. The waterfall barrier was blasted out of bedrock on two occasions: 2002 by an independent contractor which created approximately three to four feet of drop and in 2004 by USFS explosives engineers which added another three feet of drop. The second blast created a drop of more than 5 feet onto a bedrock outfall. A total of 17 EB were captured in approximately 2,200 m of Big Coulee Creek (not including tributary; Figure 8; Figure 9; Appendix 5). Numbers of WCT increased from 8 per 100 m in 2004 to 28 per 100 m in 2005 (Figure 9). The bulk of this increase was from recruitment of individuals less than 100 mm in length (Figure 10). A large and immediate rebound in survival of age-0 WCT after EB removals has also been seen in Cottonwood Creek (Arrow Drainage) in northcentral Montana. Peterson and Fausch (2004) posited that EB negatively affect cutthroat trout by reducing age-0 recruitment and age-0 and age-1 inter-annual survival to levels where replacement occurs. In Big Coulee Creek, significant rebounds in numbers of age-0 cutthroat did not occur until EB numbers were reduced and WCT increased to some unknown threshold level. In addition, there is likely some effect of a lag in time between initiation of suppression and recruitment rebound. In either case, it appears that EB can be effectively eliminated from Big Coulee Creek over the next few years to the ultimate benefit of WCT.

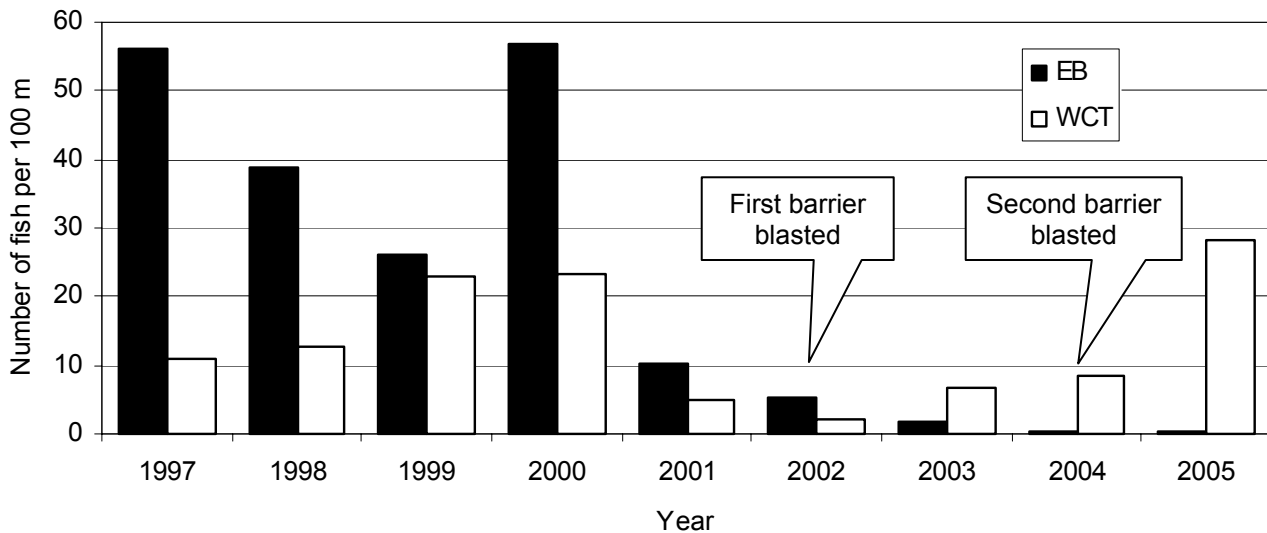


Figure 9. Relative abundance of all WCT and EB (all sizes) captured in Big Coulee Creek (upstream of natural campsite barrier) during brook trout suppression. Numbers represent relative abundance of fish normalized to fish per 100m. Suppression efforts began in 1997.

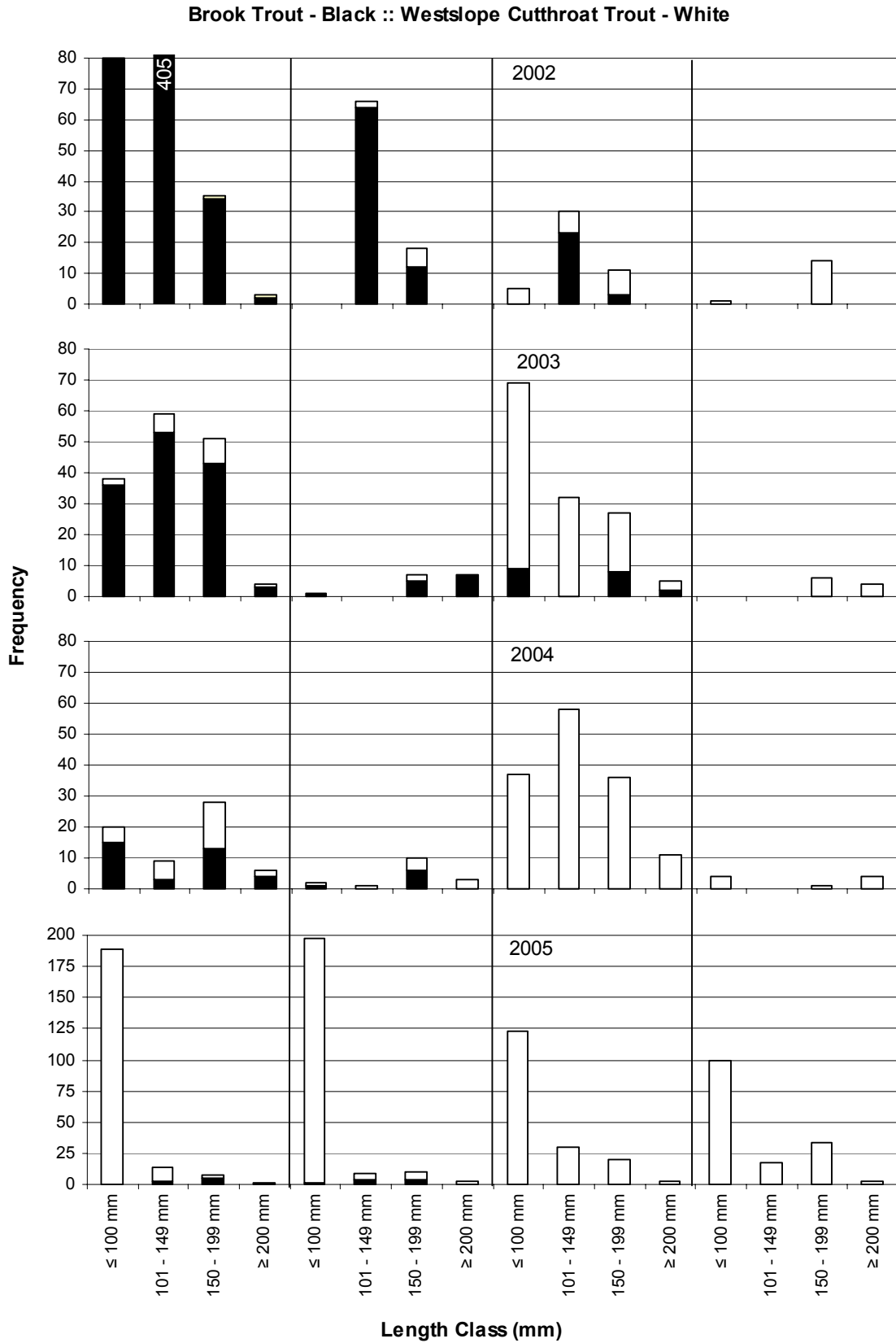


Figure 10. Length frequency of all WCT and EB captured in Big Coulee Creek in 2002, 2003, 2004, and 2005. Each sub-plot from left to right (upstream direction) represents approximately a quarter of the electrofished stream (2,707 m total length). The first sub-plot is between blasted barrier and partial campsite barrier.

Carpenter Creek On 15 April 2005, fin clips were taken from 28 fish (PINE) at the lower end of occupied habitat in Carpenter Creek (Figure 8; Appendix 5; 7). These genetic samples were collected to confirm that Carpenter Creek fish were not introgressed and could, at some point in time, be transferred to Tyrell Creek and Hound Creek Reservoir (Smith Drainage). Results of genetic tests indicated that Carpenter Creek fish were pure (Leary 2005); Appendix 6). An EA for transfer of fish from O'Brien, Carpenter, and Graveyard creeks was posted on the MFWP public website and comments were accepted until 21 May 2005. No comments were received and transfers can begin as soon as all non-native fishes in the Tyrell Creek watershed are removed and the Candidate Conservation Agreement with Assurances is finalized and signed by affected landowners.

Chamberlain Creek On 2 August 2005, population estimates were conducted at index stations below (Figure 8) and above a fish barrier constructed in 2002. A temporary barrier erected in 1996 and removed in 2002 below the lower index stations along with EB suppression significantly decreased EB numbers from 1995 to 2002. Since removal of the lower temporary barrier in 2002, EB numbers have risen sharply (Figure 11; Table 2; Appendix 5). No EB have been found in population estimates conducted above the barrier constructed in 2002 (Table 2). Population estimates above the barrier from 2001 to 2005 generally yielded higher numbers of WCT (2001-42; 2002-29; 2003-30; 2004-29; 2005-31 per 100 m) than the lower site (Table 2). Overall, numbers of WCT have declined by half that observed from 1998 to 2000. These declines are most likely the result of continuing drought conditions. Observations in 2004 and 2005 suggest the possibility that some larger fish may be able to pass the barrier during spring runoff. In 2005, modifications were made to the outfall screen (removal of some braces) to help pass medium and small sized debris, prevent clogging, and reduce chances of non-native fish passage during high runoff. On 17 August 2005, 25 genetic samples were collected (PINE) from WCT upstream of the fish barrier constructed in 2002. Results indicated that the WCT in Chamberlain Creek were indeed genetically pure WCT (Appendix 5; 6; 7; Leary 2005).

Crawford Creek On 23 and 24 August 2005, a private contractor poured a concrete fish barrier on Crawford Creek near its confluence with Belt Creek (Figure 8). Funds for barrier construction were obtained through a Challenge Cost Share between the USFS and MFWP. In 2004, USFS and MFWP crews used a compressed air jackhammer to chip out three to four feet of drop at a bedrock dominated site on Crawford Creek. With the addition of a concrete sill the new structure exceeds five feet in height and should be a barrier to upstream passage of fish at nearly all flows. The uppermost reaches of Crawford Creek still hold a small, pure population of WCT (25 PINE; collected in 2001 and 2003) upstream of a natural falls barrier. An additional 25 samples will be collected in 2005 to determine purity with more surety (99% chance of detecting 1% introgression). If additional samples confirm the purity of WCT in upper reaches of Crawford, then lower reaches (67% WCT X RBT and YCT) will be treated with rotenone or antimycin in 2006/2007 (EA to be completed). After treatment, lower fishless reaches (approximately 1.5 miles) will be re-colonized by pure WCT from upstream sources. The extant population of WCT in the headwaters of Crawford Creek is very small and may not be genetically robust enough to re-populate lower Crawford Creek. If genetic deformities emerge in the new population, WCT from an adjacent drainage may also be transferred in to Crawford Creek

Dry Fork Creek On 16 August and 14 October 2005, Dry Fork Creek was surveyed to assess the distribution and relative abundance of WCT and EB (Figure 8). Surveys indicated that the mainstem of Dry Fork Creek became dry a short distance (approximately 1.5 miles) upstream of the confluence with Oti Park Creek. A small tributary branching to the east held moderate (9 to 10 WCT per 100 m) numbers of fish (Appendix 5). WCT in this system are unprotected by barriers and are likely slightly introgressed. Genetic samples were not collected because of the proximity of genetically compromised fish downstream in Oti Park Creek. There is one potential barrier site on Oti Park Creek downstream of the confluence of Dry Fork Creek.

Gold Run Creek On 8 September 2005, ten WCT were transferred from the lower portion of a small protected population of WCT to an upstream expansion population (transfers in 2001 and 2002; 25 and 20 fish respectively). A one pass survey of the expansion population, completed during the same field visit, indicated low levels of inbreeding depression were causing physical deformities in approximately 3% of captured fish. A total of 30 fish were captured in the new population which ranged from 66 to 142 mm and averaged 111 mm in total length (Appendix 5). Deformities included spinal, opercular, and caudal defects. Leary et al. (1998) recommend transferring at minimum 25 non-sibling spawning pairs. A total transfer of 45 fish was likely inadequate to prevent founder effects and will have to be supplemented by downstream fish or transfers of small numbers of fish from adjacent drainages (i.e. Carpenter Creek). A small number (1 to 10) of fish will be transferred annually from the lower (original) population over the next several years. If this proves ineffective at reducing deformities additional transfers from out of the drainage will be considered.

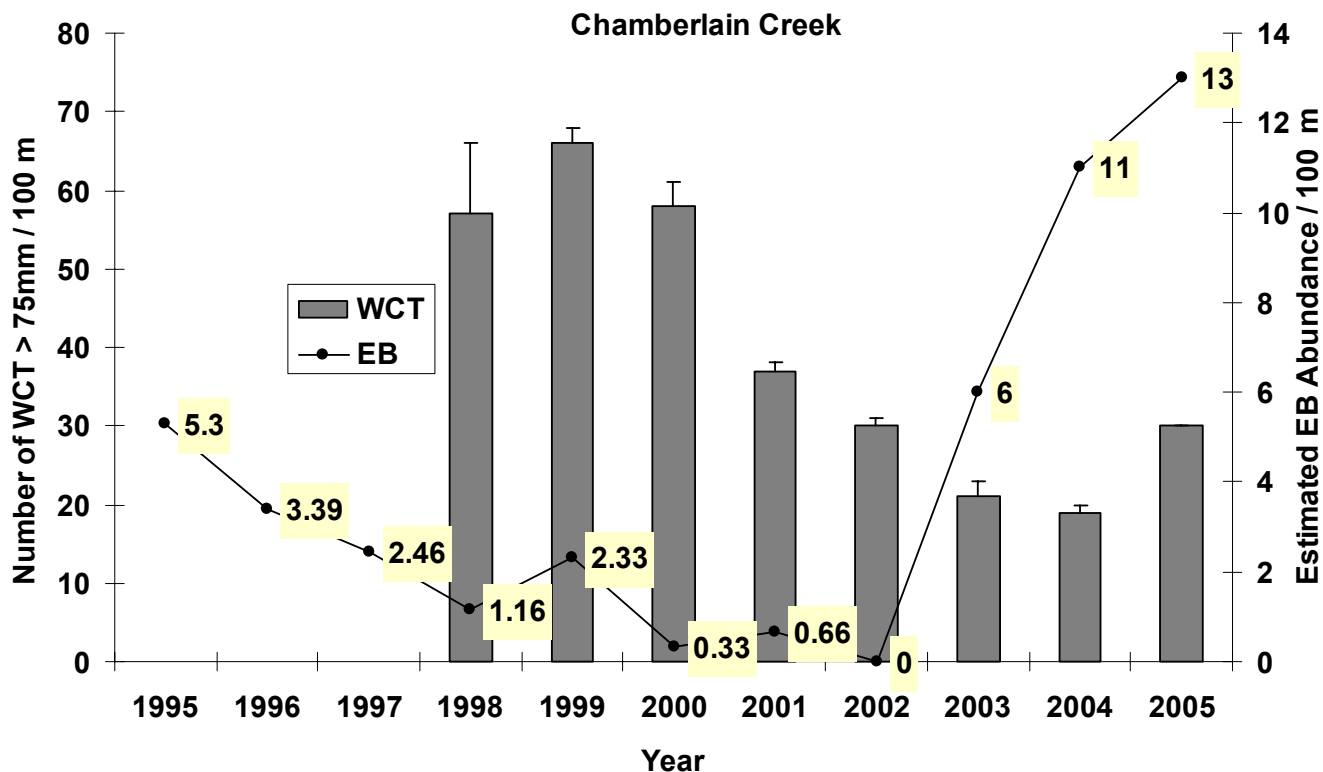


Figure 11. Abundance of WCT and EB removals in Chamberlain Creek from 1995 to 2005 at lower population monitoring sites (at or below barrier constructed in 2002). EB numbers prior to 2002 were calculated using total number of EB removed during suppression normalized to fish per 100 m. EB numbers in 2002, 2003, 2004, and 2005 were obtained from population estimates.

Graveyard Creek On 21 July 2005, fin clips were collected from 50 fish in Graveyard Creek to determine if WCT were genetically pure (Appendix 5 and 7). These genetic samples (PINE) were collected to confirm that fish could, at some point in time, be transferred to Tyrell Creek and Hound Creek Reservoir (Smith Drainage). Analysis indicated that WCT were genetically pure (Leary 2005; Appendix 6). The barrier protecting Graveyard Creek fish from rainbow trout and hybrids appears to be marginal but extensive genetic testing (85 samples total) gives confidence that these fish will likely remain pure until they are transferred to fishless habitat elsewhere. An EA for transfer of fish from O'Brien, Carpenter, and Graveyard Creek was posted on the MFWP public website and comments were accepted until 21 May 2005. No comments were received and transfers can begin as soon as all non-native fishes in the Tyrell Creek watershed are removed and the Candidate Conservation Agreement with Assurances is finalized and signed by affected landowners.

Logging Creek On 12 April 2005, a short section of stream was surveyed for barrier potential (with Peter Brown of Montana State University) and relative abundance of fishes. Five RBT and three EB were captured over 60 m of stream. In addition, a site on Oti Park Creek was visited and the potential for barrier construction was discussed. Of the two, the Oti Park Creek site has more potential as a future barrier site. The Oti Park site is remote but has some drop and is confined by bedrock on one side and large cobble/boulder banks on the other.

Lost Creek On 12 July 2005, seventeen whole fish were collected from Lost Fork Creek for genetic analysis (allozymes). Genetic interpretation of previous fin clip samples (PINE) were deemed to be in conflict with previous whole fish samples (allozyme) and additional allozyme samples were recommended (Leary 2005). Samples were collected during a population estimate at an index station that was previously surveyed in 2002. The sampled section of stream held 54 fish per 100 m (40 fish in 2002) that averaged 163 mm in length (155 mm in 2002; Figure 8; Table 2; Appendix 7). This population appears to be robust but new genetic analysis (to be completed) may reveal it to be hybridized.

Middle Fork Little Belt Creek From 28 July to 10 August 2005, EB were suppressed in the Middle Fork of Little Belt Creek upstream of a perched culvert installed in 2004 (Figure 8 and 13). A total of 22 EB were captured upstream of the road culvert in approximately 1,430 m of stream (36 were captured in 2004). In early June approximately 12 inches of rain fell on the Highwood Mountains in less than a week. The runoff associated with this event was estimated (Wayne Green, Forest Hydrologist; Personal Communication) to occur on average every 150 to 250 years. Middle Fork Little Belt Creek captured the USFS road and ran parallel to it for approximately 300 meters upstream of the culvert (Figure 13). The stream then passed through the culvert and over the road below the culvert. The culvert itself survived the event but the road required repair and the stream channel upstream was moved back into its old channel. Much of the stream channel of Middle Fork Little Belt Creek changed after the event with the formation of new pool riffle sequences, addition of woody debris, and flushing of fine sediments. WCT numbers in Middle Fork of Little Belt Creek are continuing to rebound (Figure 12; Appendix 5) despite the passage of a few EB during the runoff event. After elimination of EB, (considered two survey years with no EB encountered) WCT will be monitored on an annual basis.

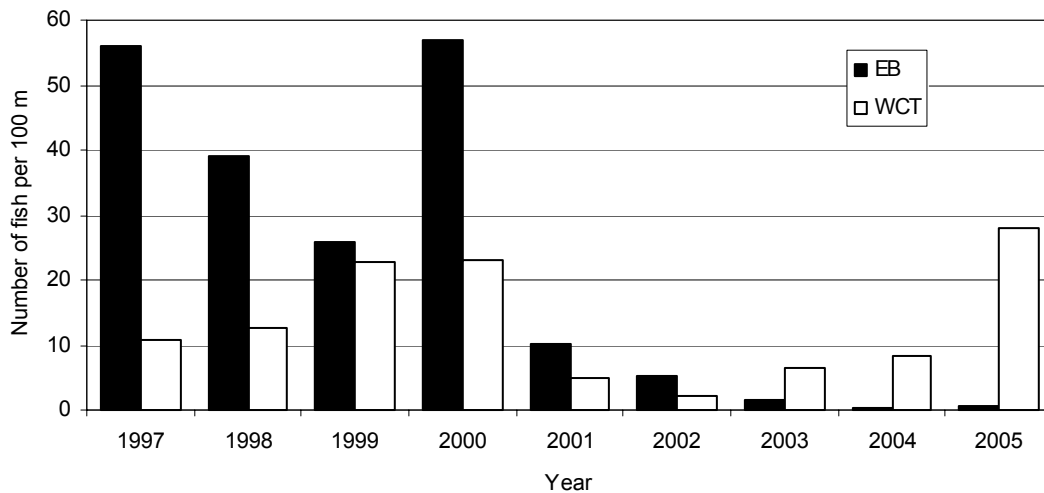


Figure 12. Relative abundance of all WCT and EB (all sizes) captured in the Middle Fork of Belt Creek in 2004. Numbers above bars are relative abundance of all fish caught during suppression efforts normalized to fish per 100 m. Suppression efforts began in 1997.



Figure 13. Photographs of runoff event on Middle Fork Little Belt Creek, June 2005.

O'Brien Creek On 16 May 2005, thirty-five whole fish (WCT X RBT hybrids and WCT) were collected from O'Brien Creek for disease testing. Fish were collected from below and above the domestic water supply reservoir for the town of Neihart (Figure 8; Appendix 5). This sampling was done to determine if there was any risk in transferring O'Brien Creek fish to Tyrell Creek and Hound Creek Reservoir. Results indicated that O'Brien Creek fish were ELISA positive and PCR negative for bacterial kidney disease (Staigmiller 2005). These results (similar to most fish tested in northcentral Montana) will likely not preclude approval of an inter-basin transfer of fish. An EA for transfer of fish from O'Brien, Carpenter, and Graveyard Creek was posted on the MFWP public website and comments were accepted until 21 May 2005. No comments were received and transfers can begin as soon as all non-native fishes in the Tyrell Creek watershed are removed and the Candidate Conservation Agreement with Assurances is finalized and signed by affected landowners.

Palisades Creek On 17 August 2005, Palisade Creek was surveyed and 15 fin clips were collected from fish near the end of occupied habitat (Figure 8; Appendix 5 and 7). Results from a previous collection of ten fin

clips collected in 2004 indicated WCT were pure in the headwaters of Palisades Creek (Leary 2005). During the second survey in 2005 it was clear that highly hybridized fishes had penetrated to the end of occupied habitat. Moreover, during sampling in 2004, rainbow trout were observed within 50 meters of fin clipped WCT below a partial barrier. It is very likely that fish tested in 2004 were at least slightly hybridized considering that there is a 70% chance of detecting 1% hybridization with a sample size of 10 fish (Leary 1998).

Wilson Creek On 1 September 2005, macroinvertebrates were collected from Wilson Creek in the Little Belt Mountains (Figure 8). D-Frame kick-net samples were collected from a diverse array of habitats above and below a fish barrier (series of cascades). Samples were collected to investigate whether any rare species of stream invertebrate would be threatened by a transfer of WCT into the fishless portion of Wilson Creek. The fishless habitat upstream of the barrier is approximately 0.50 miles in length. The kick-net samples were delivered to Dr. Daniel Gustafson of Montana State University for analysis. A disease survey and amphibian survey will also need to be completed before fish are transferred into this new habitat. A thermograph (Onset Stowaway ®) was placed in a well mixed pool in the fishless area of Wilson Creek. Low summer water temperatures may limit the ability of this site to support a self sustaining population of WCT (Harig and Fausch 2002, Coleman and Fausch 2004).

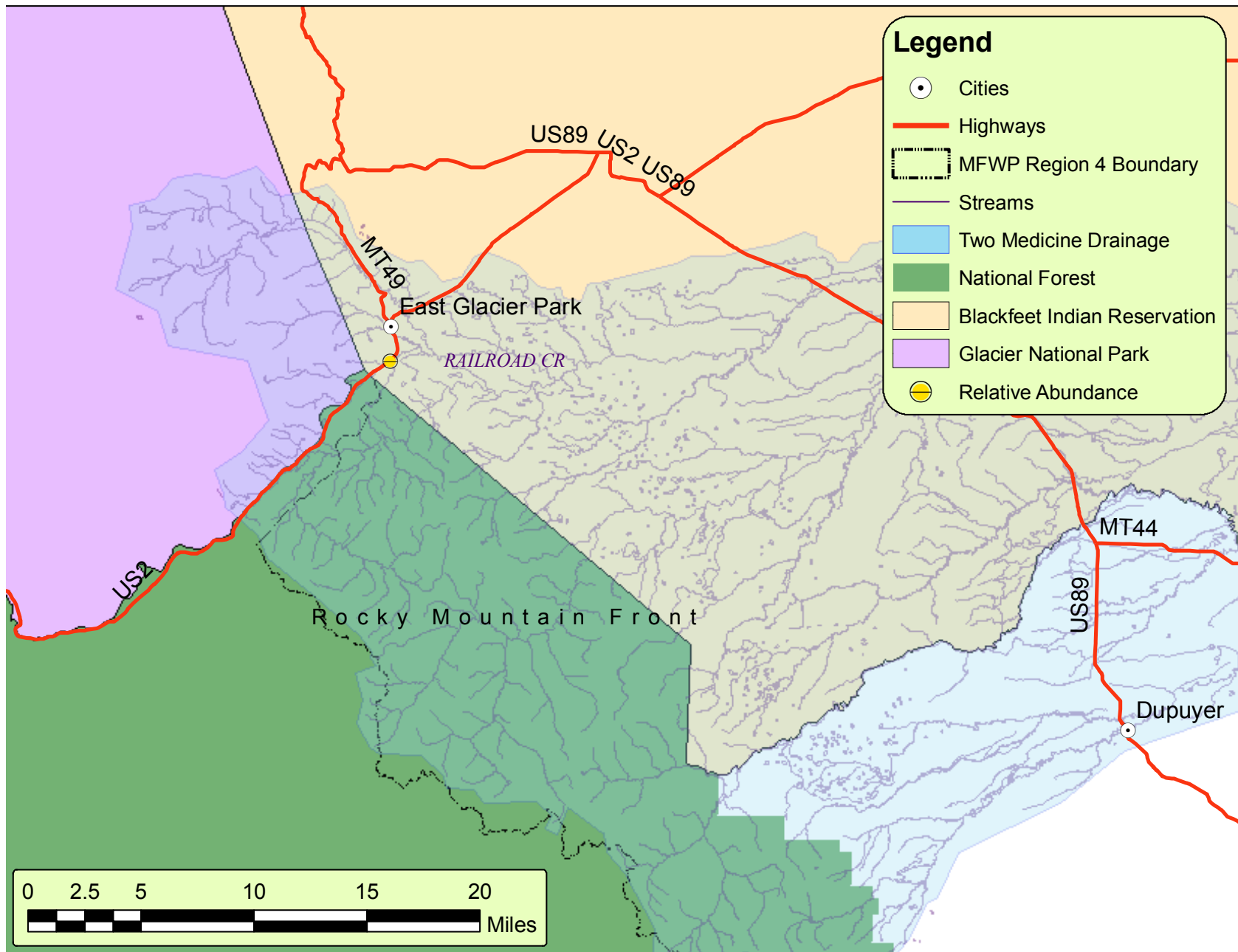


Figure 14. Two Medicine Drainage location and sampling sites, 2005.

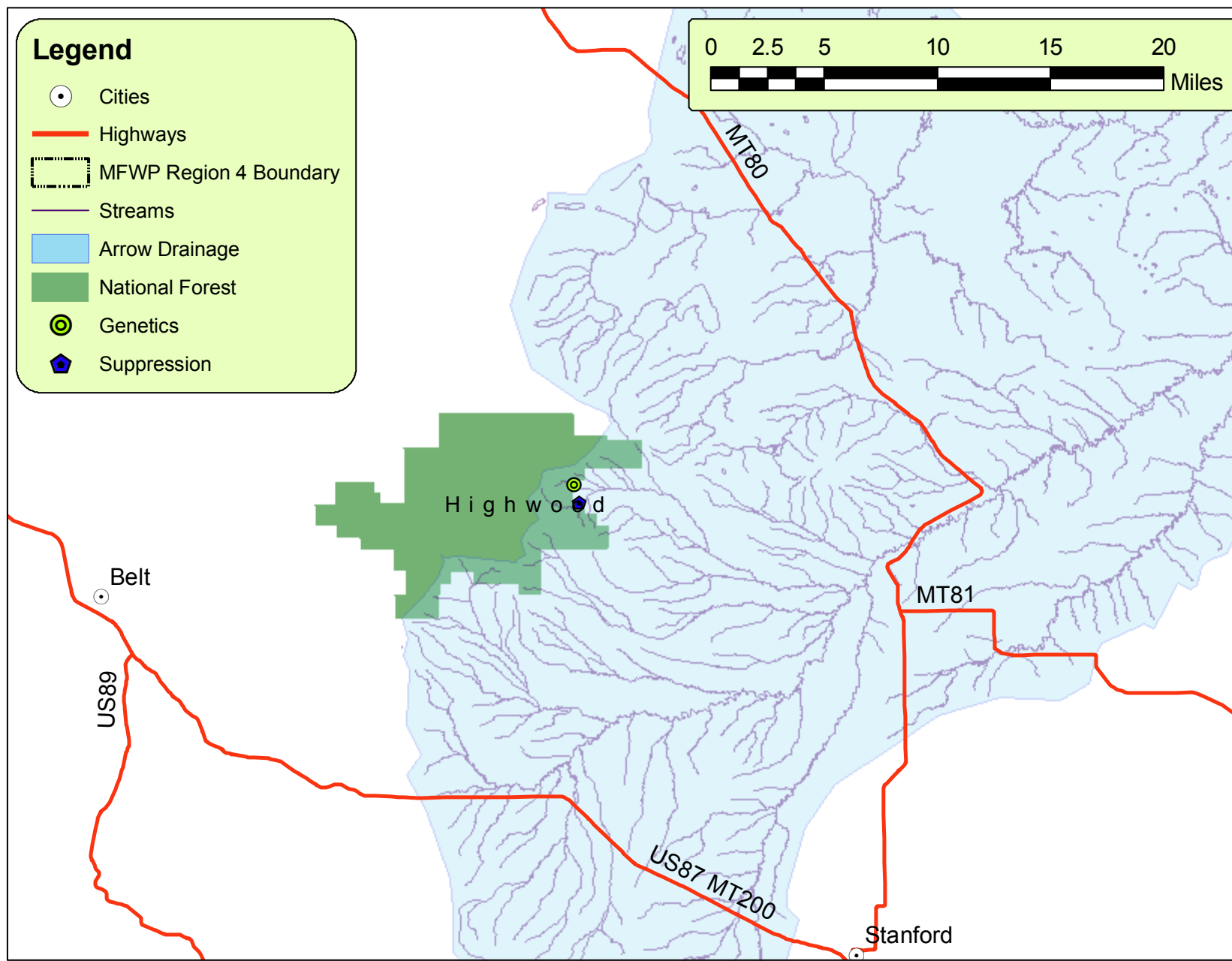


Figure 15. Arrow Creek Drainage location and sampling sites, 2005. Brook trout were suppressed in Cottonwood Creek.

Two Medicine Drainage (4th Code HUC 10030201)

Accomplishments related to WCT restoration in the Two-Medicine Drainage included, a survey for presence of WCT in Railroad Creek.

Railroad Creek On 25 August 2005, two 70 m long section of stream were surveyed above and below Buffalo Lakes for the presence of WCT. A total of 34 EB ranging from 63 to 235 mm were captured (both sections; Figure 14; Appendix 5).

Arrow Creek Drainage (4th Code HUC 10040102)

Accomplishments related to WCT restoration in the Arrow Creek Drainage included, eradication/suppression of EB in Cottonwood Creek and collection of genetic samples from Boyd Creek.

Cottonwood Creek Brook trout were suppressed/eradicated above a constructed barrier (2001) in about 4,000 m of Cottonwood Creek from 19 to 21 September 2005 (Figure 15; Table 2; Appendix 5). One to three crews electrofished nine sections, ranging in length from 115 to 350 m. Sections were block netted and electrofished twice in an upstream direction. A small tributary just upstream of the barrier and the uppermost 1,000 m of stream were electrofished with one pass. No brook trout were found over the length of stream electrofished and approximately 1,216 WCT were counted and measured (Appendix 5). Since 2003, there has been some fluctuation in abundance of juvenile and adult WCT (Figure 16). However, in most years since EB suppression began age-0 WCT have been abundant and widespread. The abundance of age-0 WCT is not reflected in counts because of the difficulty in capturing them without spending excessive time and causing excessive mortalities. This population of WCT appears to be robust with most year classes well represented but with significant inter-annual variation in year class strength. Variation is probably partly the result of continuing drought conditions in northcentral Montana (Figure 16). No EB were captured in Cottonwood Creek in 2004 and 2005. In 2002 22 EB and in 2003 eight EB were captured during suppression efforts. In 2006, three to four population monitoring sections will be set up along the length of Cottonwood Creek to monitor population health and insure that EB have truly been eradicated. If EB are discovered during monitoring suppression/eradication efforts will resume.

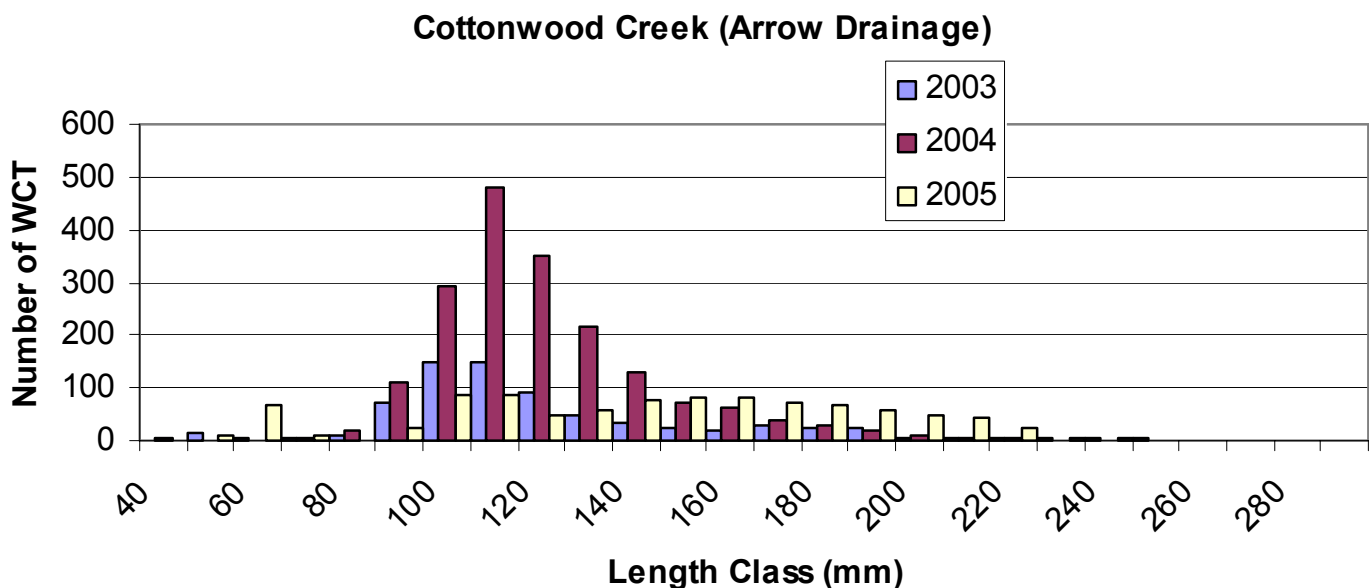


Figure 16. Length frequency of WCT captured in Cottonwood Creek (Arrow Drainage) from 2003 to 2005.

Boyd Creek On 14 October 2005, 24 genetic samples (PINE) were collected from a small allopatric population of WCT in the headwaters (upstream of the national forest boundary) of Boyd Creek (Figure 15). Boyd Creek enters Cottonwood Creek approximately 1,500 meters downstream of the constructed barrier on mainstem Cottonwood Creek. Twenty-seven fish were collected from Boyd Creek in 2004 and analyzed for genetic purity (Appendix 6). Results from the 2004 sample indicated that the Boyd Creek fish were pure but that one fish had genetic characteristics at one marker indistinguishable from rainbow trout (Leary 2005). Results from the 2005 sample indicated that Boyd Creek WCT are genetically pure (Appendix 5; 6; 7; Leary 2005). Since no barrier currently exists in the Boyd Creek drainage, options for protection and enhancement of this WCT population were discussed. Old disused and breached beaver dams just downstream of the population (on private property) at one time held large numbers of larger WCT. The option of creating a barrier/pond at this site was discussed but rejected because it is antithetical to MFWP pond policy. This population is very small (< 200 individuals) and will, in the near future, be replaced by EB or become extinct because of reverse density dependent effects (Courchamp et al.).

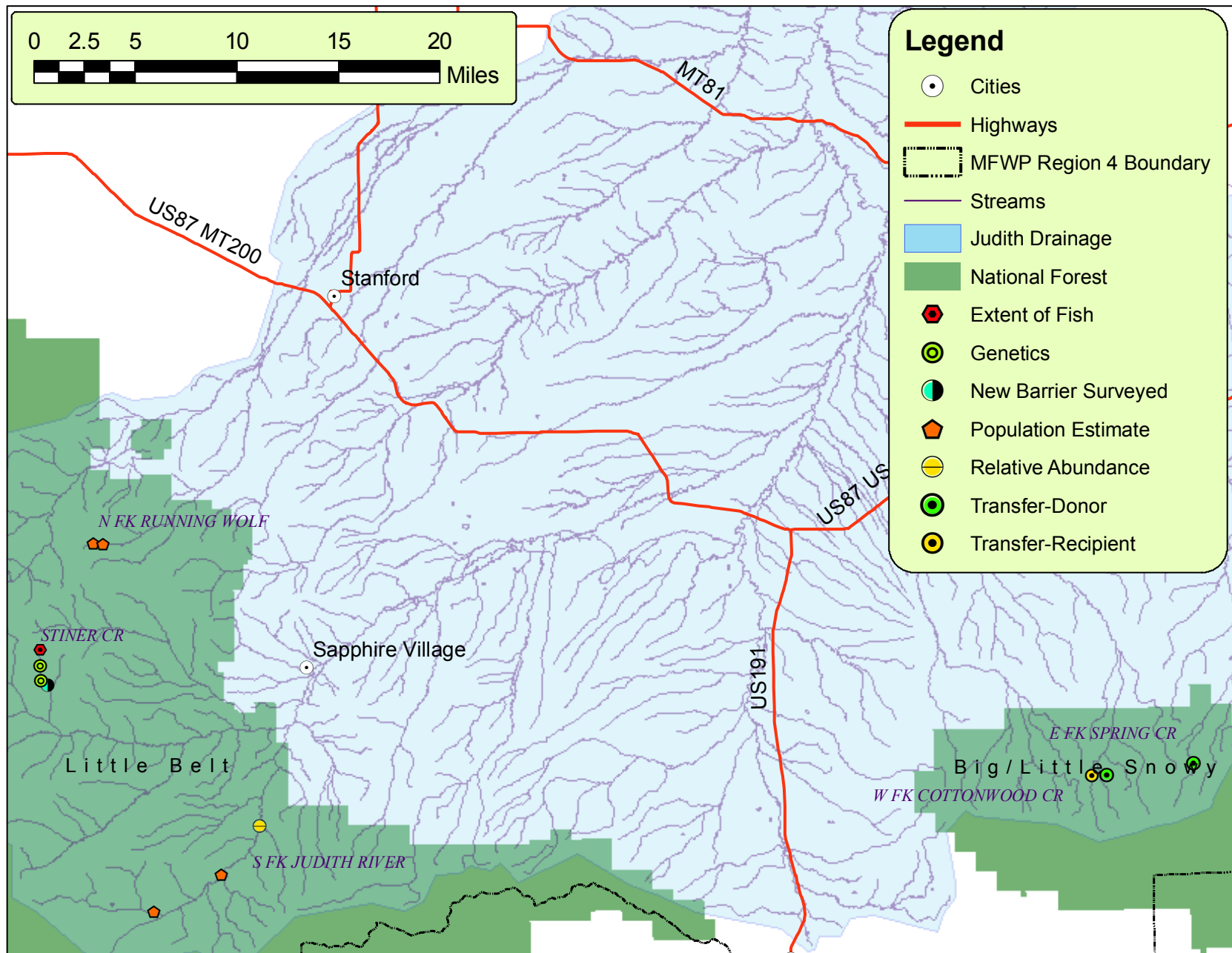


Figure 17. Judith Drainage location and sampling sites, 2005.

Judith Drainage (4th Code HUC 10040103)

Accomplishments related to WCT restoration in the Judith River Drainage included a transfer of genetically pure WCT from East Fork Big Spring Creek (Snowy Mountains) to North Fork Ford Creek (Rocky Mountain Front), a transfer of WCT from a tributary to West Fork Cottonwood Creek to previously fishless habitat in West Fork Cottonwood Creek (Snowy Mountains), WCT surveys of Stiner Creek, and population estimates in South Fork Judith River and North Fork Running Wolf Creek.

East Fork Big Spring Creek On 9 August 2005, 100 WCT ranging from 63 to 242 mm total length (average 156 mm) were moved from East Fork Big Spring Creek (T14N R10E Sec16) to North Fork Ford Creek (T19N R9W Sec3) (Figure 6 and 17). WCT were collected on 8 August and transferred upstream about 1 mile to a site near a helicopter-landing area that had been cut out by USFS personnel earlier in the summer. Estimates of abundance in each year were gleaned from collection efforts during transfers. In 2005, the WCT estimate of 53 fish per 100 m (≥ 100 mm; Appendix 5) was higher than the 36 and 34 fish per 100 m estimate in 2004 and 2003, respectively (Moser et al. 2003 and 2004). Fish were taken from the same general area of East Fork Spring Creek in all years. There is approximately 1.5 miles of high quality habitat in this stream. If we assume population numbers throughout the occupied stream are similar to these estimates (between 25 and 50 fish per 100 m), the total population size would be between 600 and 1,200 WCT ≥ 100 mm. This will likely be the last transfer of fish from this stream to North Fork Ford Creek for several years. The total transfer of fish from 2004 and 2005 is 209 and should be adequate to prevent inbreeding depression in the new population. If the new population is successful it will be monitored for genetic defects (starting in 2007). If genetic defects are encountered in future surveys of North Fork Ford Creek, additional fish will be transferred.

North Fork Running Wolf Creek On 28 September 2005, two population estimates were completed in the headwaters of North Fork Running Wolf Creek. The upper section held 18 fish per 100 m (14 in 2002) that averaged 155 mm in total length (130 mm in 2002). The lower section held 31 fish per 100 m (41 in 2002) that averaged 139 mm in total length (135 mm in 2002; Figure 17; Table 2; Appendix 5). WCT from both sections combined ranged in size from 108 to 203 mm. This population of pure WCT is very small, and though stable, at great risk of extinction in the near future.

South Fork Judith River On 18 August 2005, crews surveyed fish population density and biomass in the South Fork Judith River just upstream of the mouth of Bluff Mountain Creek (Figure 17; Table 2; Appendix 5). Eighty-five *Oncorhynchus* sp. were captured per 100 m near Bluff Mountain Creek (Table 2), higher than the 61 estimated in October 2004 and the 51 estimated in August 2002 (Moser et al. 2002 and 2004). The average length of 146 mm in 2005 was similar to lengths in 2004 (150 mm) and 2002 (157 mm). No EB were captured in 2005 (two were captured in 2004). On 27 October 2005, crews surveyed fish population density and biomass near the confluence with Russian Creek. One hundred twenty-five *Oncorhynchus* sp. were captured per 100 m near Russian Creek (Figure 17; Table 2; Appendix 5). In addition, a total of four EB were captured over the entire section length of 134 m. The average relative weight (W_R) of *Oncorhynchus* sp. in the Bluff Mountain and Russian Creek samples was 94 and the 58, respectively. Relative weights were calculated using standard weights of WCT (Kruse and Hubert 1997). Genetic samples were collected from 25 fish (PINE) during the Russian Creek sampling. These fin clips were archived for possible future analysis (Appendix 7). A population estimate was attempted at Dry Pole Creek on 18 August 2005. Fish were accidentally spilled from one of the live cars separating passes making estimates of abundance meaningless. Lengths and weights of captured fish are presented in Appendix 5.

Design and engineering of the fish barrier to be built just upstream of Bluff Mountain Creek was completed in mid-November of 2005. The barrier will be constructed in September of 2006. Construction contracts will be administered by MFWP Design and Construction. Construction oversight will be the responsibility of the

design engineer (EMC² Engineering), MFWP Design and Engineering, and USFS engineers. NEPA was completed in 2004 (Decision Notice - FONSI, 2 April 2004). Funding for the barrier was obtained in 2003 from the Future Fisheries program of MFWP, American Fisheries Society Montana Chapter, and the Montana Trout Foundation. Additional funds were obtained from Future Fisheries and the National Fish and Wildlife Foundation in 2005/2006 because of increases in construction costs from the conceptual design estimate. An EA will be drafted in spring of 2006 analyzing the options for removal of non-native fishes upstream of the barrier to be constructed in 2006. In addition, longitudinal genetic samples will be collected from the South Fork Judith River during summer of 2006 to determine where removals should take place along a predicted gradient of genetic purity. The eventual goal is to maintain at least 95% genetic purity above the constructed barrier.

Stiner Creek On 27 September 2005, genetic samples (25 PINE) were collected at the upstream end of occupied habitat in Stiner Creek and downstream of a partial barrier lower in the drainage (Figure 17; Appendix 5 and 7). The upstream sample was analyzed and was found to be a mixture of non-hybridized WCT and fish of hybrid swarm origin (Leary 2005; Appendix 6). Much of Stiner Creek below the confluence with East Fork Stiner is dry during the summer and fall but likely allows passage during spring.

West Fork Cottonwood Creek, On 7 September 2005, 88 WCT were moved from a tributary of West Fork Cottonwood Creek to one mile of fishless habitat above a series of barriers on West Fork Cottonwood Creek (Figure 17; Appendix 5). Fish were carried across an approximately ¼ mile saddle separating the drainages. Transferred fish ranged from 26 to 256 mm in length. The average size of fish transferred was 159 mm. Another transfer of fish is planned for 2006. Eighty-eight WCT were moved to and from the same sites in 2004. In 2004, transferred fish ranged from 74 to 229 mm in length (average 151; Moser et al. 2004).

Table 2. Depletion removal estimates for fish > 100 mm from northcentral Montana streams, 2005.

Stream Site <u>Legal</u> <i>Section length</i>	Date	Species	No. fish per 100 m (95% CI; lower bound at catch)	Average Length Fish > 100 mm	Probability of Capture
S. Fk. Judith River Above Bluff Mtn <u>T11N R11E Sec 4</u> <i>175 m</i>	8/18/05	<i>Oncorhynchus</i> spp.	85 (85-86)	160	0.84 (3-pass)
S. Fk. Judith River Below Russian <u>T11N R10E Sec 13</u> <i>134 m</i>	10/27/05	Westslope cutthroat trout	125 (122-128)	158	0.86 (2-pass)
Chamberlain Creek Lower <u>T13N R8E Sec 2</u> <i>100 m</i>	8/2/05	Brook trout	3 (no CI)	182	no fish 2 nd pass
		Westslope cutthroat trout	22 (no CI)	161	no fish 2 nd pass
Chamberlain Creek Upper <u>T13N R8E Sec 2</u> <i>150 m</i>	8/2/05	Brook trout	13 (13-14)	155	0.93
		Westslope cutthroat trout	31 (31-33)	159	0.76 (3-pass)
N. Fk. Running Wolf Creek Lower <u>T14N R10E Sec 17</u> <i>100 m</i>	9/28/05	Westslope cutthroat trout	31 (31-33)	139	0.86 (2-pass)
N. Fk. Running Wolf Creek Upper <u>T14N R10E Sec 17</u> <i>100 m</i>	9/28/05	Westslope cutthroat trout	18 (18-20)	155	0.72 (3-pass)
W. Fk. Cottonwood Creek Castles <u>T8N R8E Sec 17</u> <i>150 m</i>	9/14/05	Westslope cutthroat trout	23 (23-25)	189	0.85 (2-pass)
Lost Creek <u>T16N R9E Sec 29</u> <i>100 m</i>	7/7/05	Westslope cutthroat trout	54 (54-56)	163	0.79 (3-pass)
Cottonwood Creek Arrow <u>T19N R10E Sec 5,6</u> <i>115-350 m</i> 9 Sections	9/19/05 to 9/21/05	Westslope cutthroat trout	Range for Sections 17-67 Average 35	Range for Sections 143-198 Average 164	Range for Sections 0.67-0.94 (2-pass)

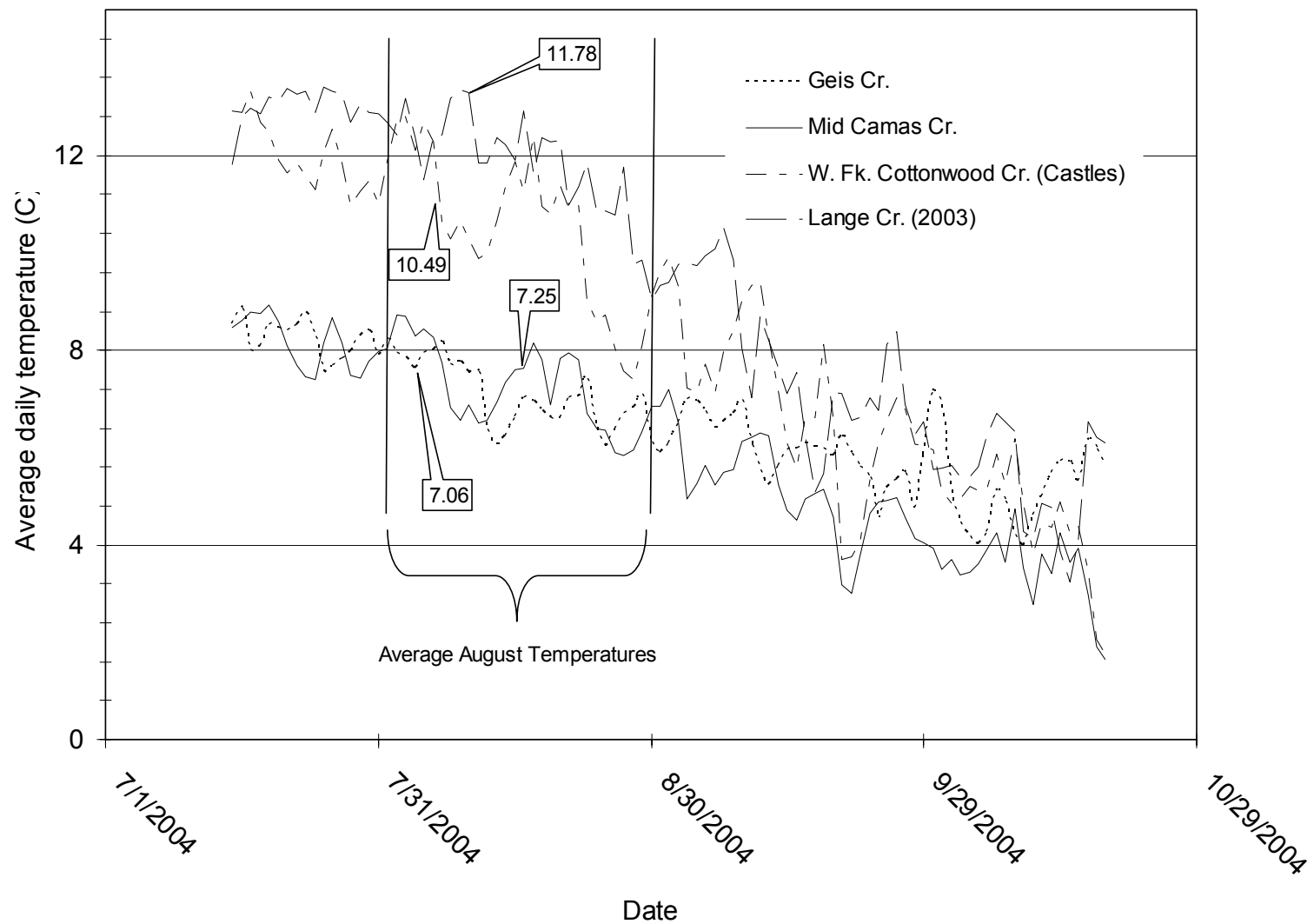
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Appendix 1. Average daily water temperature in Geis Creek, Mid Camas Creek, and W. Fk. Cottonwood Creek, 2005. Lange Creek temperatures are from 2003.

Appendix 2. Decrease or increase in miles of stream in 2005 with genetically pure WCT.

Drainage	Stream	Activity	Miles	Purity
Belt				
	Palisade Cr.	New Data (Proximity)	-1.00	95.00%
Judith				
	Weatherwax Cr., Upper	New Stream Site Pure	+1.00	100.00%
Smith				
	Lone Willow Cr.	New Stream Site Pure	+1.00	100.00%
	French Cr., Lower/Upper	New Data	-1.50	92.00%
Grand Total			-0.50	

Appendix 3. Miles of stream in 2005 with pure or nearly pure WCT. Fish tested as greater than 99.5% and less than 100% WCT were not included in Table 1 accounting. Symbols indicate streams which have substantial protection from introgression: £ = manmade barrier, ¥ = mining effluent barrier, ▣ = falls barrier, Ø = dry channel barrier.

Drainage	Stream	Miles	Genetic Purity
Arrow			
	Boyd Cr.	1.00	100.00%
	Cottonwood Cr.	(£) 2.00	100.00%
		3.00	
Belt			
	Belt Cr., Upper	6.00	100.00%
	Bender Cr.	0.50	100.00%
	Carpenter Cr.	(¥) 3.00	100.00%
	Chamberlain Cr.	(£) 5.00	100.00%
	Crawford Cr.	1.00	100.00%
	Gold Run Cr.	(▣) 3.00	100.00%
	Gold Run Cr., Upper	(▣) 0.25	100.00%
	Gold Run Cr., Upper, Upper	(▣) 0.25	100.00%
	Graveyard Gulch	1.50	100.00%
	Harley Cr., Upper, Trib.	1.00	100.00%
	Little Belt Cr., M. Fk.	1.00	100.00%
	Little Belt Cr., M. Fk., Upper	(£) 1.00	100.00%
	Little Belt Cr., N. Fk., Lower	(▣) 1.00	100.00%
	Little Belt Cr., N. Fk., Upper	(▣) 1.50	100.00%
	Logging Cr.	2.00	100.00%
	O'Brien Cr.	(▣) 2.25	100.00%
	Pilgrim Cr., Upper	5.00	100.00%
	Shorty Cr.	1.00	100.00%
		36.25	
Highwood			
	Big Coulee Cr.	(£) 2.00	100.00%
		2.00	
Judith			
	Big Hill Cr.	2.00	99.70%
	Cottonwood Cr., W. Fk.	(Ø) 1.50	100.00%
	Cottonwood Cr., W. Fk., Upper	(▣) 1.00	100.00%
	Running Wolf Cr., N. Fk.	(Ø) 1.50	100.00%
	Big Spring Cr., E. Fk.	(Ø) 2.50	100.00%
	Weatherwax Cr., Upper	1.00	100.00%
		8.50	
Musselshell			
	Collar Gulch	(Ø) 2.00	100.00%
	Half Moon	(Ø) 5.00	100.00%
		7.00	
Drainage	Stream	Miles	Genetic Purity

Smith

Cottonwood Cr., E. Fk & W. Fk.	(Ø) 4.50	100.00%
Daniels Cr.	3.00	99.60%
Deadman Cr. N. Fk.	1.50	100.00%
Deep Cr., N. Fk	(Ø) 2.00	100.00%
Deep Cr., N. Fk, Upper	(▣) 2.00	100.00%
Four mile Cr., Upper	(▣) 1.00	100.00%
Jumping Cr.	2.00	100.00%
Lone Willow Cr.	1.00	100.00%
Mid Camas Cr.	(▣) 1.50	100.00%
Richardson Cr.	1.50	100.00%
	20.00	

Sun

N. Fk. Ford Cr.	(▣) 1.50	100.00%
Petty Cr.	(▣) 3.00	100.00%
	4.50	

Teton

Green Gulch, Upper	2.00	100.00%
Rierdon Gulch, Upper	2.00	100.00%
Willow Cr., N. Fk.	1.50	100.00%
	5.50	

Two Medicine

Badger Cabin Cr.	(▣) 2.00	100.00%
Birch Cr., S. Fk.	(▣) 4.00	100.00%
Dupuyer Cr., M. Fk., Above Dam	(£) 0.62	100.00%
Dupuyer Cr., S. Fk., Upper	(▣) 1.40	100.00%
Lonesome Cr.	(▣) 2.00	99.60%
Midvale Cr.	(£) 4.00	100.00%
North Badger Cr.	(▣) 20.00	100.00%
Red Poacher Cr.	(▣) 2.00	100.00%
Rival Cr.	(▣) 0.50	100.00%
Sidney Cr. , Above Barrier	(▣) 1.00	100.00%
South Badger Cr.	(▣) 1.00	100.00%
Whiterock Cr.	3.00	99.60%
	41.52	

Upper Missouri

Page Gulch	1.50	100.00%
Rooster Bill	2.00	100.00%
Skelly Gulch	(£) 3.50	100.00%
Three Mile Cr.	(£) 5.00	100.00%
	12.00	

Grand Total	141.27	
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Appendix 4. Modifications in purity and miles of stream that support westslope cutthroat populations in 2005. Changes in stream miles because of new distribution data (field observations), changes in stream miles because of new genetic data, and newly discovered pure populations.

Drainage	Stream	Activity	Miles 2000	Purity	Date	Miles Current	Purity Current	Date
Arrow	Boyd Cr.	Confirmed Pure WCT	1.00	100.00%	1996	1.00	100.00%	2005
	Cottonwood Cr.	Confirmed Pure WCT	2.00	100.00%	1995	2.00	100.00%	2002
			3.00			3.00		
Belt	Carpenter Cr.	Confirmed Pure WCT	3.00	100.00%	1997	3.00	100.00%	2005
	Chamberlain Cr.	Confirmed Pure WCT	5.00	100.00%	1998	5.00	100.00%	2005
	Graveyard Gulch	Confirmed Pure WCT	1.50	100.00%	1995	1.50	100.00%	2005
	Jefferson Cr.	Increase From Less Than Pure Because of New Data	5.00	98.00%	1998	5.00	99.00%	2005
	Lost Cr.	Need Additional Data	1.00	100.00%	1996	1.00	94.50%	2002
	O'Brien Cr.	Confirmed Pure WCT	2.25	100.00%	1998	2.25	100.00%	1998
	Palisade Cr.	Decrease From Pure Because of New Data (No				1.00	95.00%	2005
			17.75			18.75		
Judith	Big Hill Cr.	Provisionally Pure	2.00	100.00%	1995	2.00	99.70%	2000
	Cottonwood Cr., E. Fk.	Increase From Less Than Pure Because of New Data				4.00	99.30%	2002
		Distance Change Because of New Data	5.00	98.00%	1996	4.00	98.00%	1996
	Stiner Cr., W. Fk.	New Stream Site Less Than Pure				1.50	95.00%	2005
	Weatherwax Cr.	Distance Change Because of New Data	4.00	91.00%	1996	3.00	91.00%	1996
	Weatherwax Cr., Upper	New Stream Site Pure				1.00	100.00%	2003
			11.00			15.50		
Smith	Daniels Cr.	Provisionally Pure	3.00	100.00%	1994	3.00	99.60%	2001
	French Cr., Lower/Upper	Decrease From Pure Because of New Data	1.50	100.00%	1990	1.50	92.00%	2004
	Jumping Cr.	Confirmed Pure WCT				2.00	100.00%	2005
	Lone Willow Cr.	New Stream Site Pure				1.00	100.00%	2005
			4.50			7.50		
Teton	Cow Cr.	Provisionally Pure	1.50	100.00%	1990	1.50	99.50%	2000
	Green Gulch, Lower	Increase From Less Than Pure Because of New Data	1.00	95.00%	1994	1.00	99.00%	2003
	Green Gulch, Upper	Confirmed Pure WCT	2.00	100.00%	1993	2.00	100.00%	2005
			4.50			4.50		
Two Medicine	Hall Cr.	New Stream Site Less Than Pure				1.00	90.00%	2003
						1.00		
Upper Missouri	Three Mile Cr.	Confirmed Pure WCT	5.00	100.00%	1996	5.00	100.00%	2005
			5.00			5.00		
Grand Total			45.75			55.25		

Appendix 5. Statistics of fish captured during stream surveys in 2005. N, CPUE (100 m) and CPUE (hr.) calculated from 1st pass samples. Minimum, maximum, and averages calculated from total catch (all fish). Samples were collected by MFWP and the USFS.

Sampling Site	Drainage	Legal	Species	Date	Length (m)	Seconds Sampled	N	Min	Total Length (mm)		CPUE (100 m)	CPUE (hr.)
									Max	Avg		
Big Coulee Creek, Section 1, Suppression <i>(Belt)</i>		<i>T19N R9E Sec10</i>										
			WCT	7/12/2005	125	2856	35	72	105	89	28	44
Big Coulee Creek, Section 2, Suppression <i>(Belt)</i>		<i>T19N R9E Sec10</i>										
			WCT	7/20/2005	515	8089	169	60	210	85	33	75
			EB	7/20/2005	515	8089	8	136	164	149	2	4
Big Coulee Creek, Section 3, Suppression <i>(Belt)</i>		<i>T19N R9E Sec10</i>										
			WCT	7/20/2005	150	4093	47	71	197	86	31	41
			EB	7/20/2005	150	4093	3	92	161	128	2	3
Big Coulee Creek, Section 4, Suppression <i>(Belt)</i>		<i>T19N R9E Sec10</i>										
			WCT	8/11/2005	466	6290	162	71	223	91	35	93
			EB	8/11/2005	466	6290	6	140	158	149	1	3
Big Coulee Creek, Section 5, Suppression <i>(Belt)</i>		<i>T19N R9E Sec10</i>										
			WCT	8/15/2005	510	5906	176	63	207	103	35	107
Big Coulee Creek, Section 6, Suppression <i>(Belt)</i>		<i>T19N R9E Sec10</i>										
			WCT	8/15/2005	440	5847	151	68	206	108	34	93
Big Coulee Creek, Tributary, Suppression <i>(Belt)</i>		<i>T19N R9E Sec10</i>										
			WCT	7/20/2005	900	3217	1	92	92	92	0	1
Boyd Creek, Boundary, Genetics <i>(Smith)</i>		<i>T20N R10E Sec32</i>										
			WCT	10/14/2005	355	1445	32	134	215	175	9	80
Carpenter Creek, End of Mine Tailings, Genetics <i>(Belt)</i>		<i>T14N R8E Sec15</i>										
			WCT	4/15/2005	190	1800	28	99	217	158	15	56
Chamberlain Creek, Lower, Population Estimate <i>(Belt)</i>		<i>T13N R8E Sec2</i>										
			WCT	8/2/2005	100	1751	30	65	248	143	30	62
			EB	8/2/2005	100	1751	13	126	199	153	12	25

Sampling Site	Drainage	Legal	Species	Date	Length (m)	Seconds Sampled	N	Min	Total Length (mm)		CPUE (100 m)	CPUE (hr.)
									Max	Avg		
Chamberlain Creek, Upper, Genetics (Belt)		T13N R8E Sec2										
			WCT	8/17/2005		1187	28	110	264	180		85
Chamberlain Creek, Upper, Population Estimate (Belt)		T13N R8E Sec2										
			WCT	8/2/2005	150	3350	58	76	228	143	33	53
Cottonwood Creek, Tributary, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/20/2005	1258		261	70	240	142	21	
Cottonwood Creek, Section 1, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/19/2005	145	1921	33	52	320	194	20	54
Cottonwood Creek, Section 10, Suppression (Arrow)		T19N R10E Sec6										
			WCT	9/21/2005	180	1777	88	49	219	138	43	158
Cottonwood Creek, Section 11, Suppression (Arrow)		T19N R10E Sec6										
			WCT	9/21/2005	350	3805	330	45	233	126	86	285
Cottonwood Creek, Section 2, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/19/2005	115	1736	37	115	263	189	30	71
Cottonwood Creek, Section 3, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/20/2005	350	1457	12	113	258	181	3	30
Cottonwood Creek, Section 4, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/20/2005	256	1547	48	49	215	137	17	102
Cottonwood Creek, Section 5, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/20/2005	185	2058	104	52	220	145	50	161
Cottonwood Creek, Section 6, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/20/2005	175	1434	55	50	225	175	27	118

Sampling Site	Drainage	Legal	Species	Date	Length (m)	Seconds Sampled	N	Min	Total Length (mm)		CPUE (100 m)	CPUE (hr.)
									Max	Avg		
Cottonwood Creek, Section 7, Suppression (Arrow)		T19N R10E Sec5										
			WCT	9/21/2005	195	2477	58	52	210	142	24	68
Cottonwood Creek, Section 8, Suppression (Arrow)		T19N R10E Sec6										
			WCT	9/21/2005	190	1843	84	52	215	129	31	113
Cottonwood Creek, Section 9, Suppression (Arrow)		T19N R10E Sec6										
			WCT	9/21/2005	200	10000	106	51	210	124	53	38
Cottonwood Creek, East Fork, Transfer/Population Estimate (Smith)		T8N R8E Sec23										
			WCT	9/14/2005	150	2936	51	73	263	160	21	39
Cottonwood Creek, W. Fk., Tributary, Transfer (Judith)		T12N R18E										
			WCT	9/7/2005	345	4611	103	26	265	168	30	80
Daniels Creek, Diversion, Suppression (Smith)		T12N R7E Sec22										
			HYB	9/29/2005	670	5632	30	95	243	176	4	19
			EB	9/29/2005			16	120	268	159	2	10
Dry Fork Belt Creek, Lower, Relative Abundance (Belt)		T15N R8E Sec23										
			WCT	10/14/2005	100	1638	27	88	255	181	27	59
			EB	10/14/2005	100	1638	78	63	264	139	78	171
Dry Fork Belt Creek, Tributary, Site A, Relative Abundance (Belt)		T15N R9E Sec33										
			WCT	8/16/2005	83		8	85	243	131	10	
			EB	8/16/2005	83		1	163	163	163	1	
Dry Fork Belt Creek, Tributary, Site B, Relative Abundance (Belt)		T15N R9E Sec33										
			WCT	8/16/2005	87		8	98	215	133	9	
East Fork Big Spring Creek, Middle, Transfer/Genetics (Judith)		T12N R19E Sec9										
			WCT	8/8/2005	200	6268	117	63	254	157	59	67
Gold Run Creek, Lower, Transfer (Belt)		T15N R9E Sec18										
			WCT	9/8/2005		632	10	113	198	147		57

Sampling Site	Drainage	Legal	Species	Date	Length (m)	Seconds Sampled	N	Min	Total Length (mm)		CPUE (100 m)	CPUE (hr.)
									Max	Avg		
Gold Run Creek, Upper, Relative Abundance												
	(Belt)	T15N R9E Sec18	WCT	9/8/2005	125		30	66	142	111	24	
Graveyard Creek, Above Barrier, Genetics												
	(Belt)	T14N R7E Sec36	WCT	7/21/2005		2621	58	76	222	151		80
Jumping Creek, Section 1, Suppression												
	(Smith)	T12N R8E Sec18	EB	7/13/2005	335	5583	161	61	182	118	48	104
Jumping Creek, Section 2, Suppression												
	(Smith)	T12N R8E Sec18	EB	7/14/2005	380	6345	163	55	184	115	43	92
Jumping Creek, Section 3, Suppression/Genetics												
	(Smith)	T12N R8E Sec18	WCT	7/25/2005	380	6832	3	126	140	135	1	2
			EB	7/25/2005	380	6832	73	60	185	124	19	38
Jumping Creek, Section 4, Suppression/Genetics												
	(Smith)	T12N R8E Sec8	WCT	7/26/2005	700	9334	40	74	158	127	6	15
			EB	7/26/2005	700	9334	101	58	162	116	14	39
Jumping Creek, Section 5, Suppression/Genetics												
	(Smith)	T12N R8E Sec8	WCT	7/26/2005	480	7098	15	61	160	129	3	8
			EB	7/26/2005	480	7098	25	62	170	119	5	13
Jumping Creek, Section 6, Suppression												
	(Smith)	T12N R8E Sec8	WCT	7/27/2005	435	3667	11	77	215	159	3	11
			EB	7/27/2005	435	3667	17	69	211	135	4	17
Jumping Creek, Section 7, Suppression												
	(Smith)	T12N R8E Sec8	WCT	7/27/2005	760	5700	7	154	184	170	1	4
			EB	7/27/2005	760	5700	26	64	221	142	3	16
Jumping Creek, Section 8, Suppression												
	(Smith)	T12N R8E Sec8	EB	8/1/2005	625	2856	2	147	167	157	0	3

Sampling Site	Drainage	Legal	Species	Date	Length (m)	Seconds Sampled	N	Min	Total Length (mm)		CPUE (100 m)	CPUE (hr.)
									Max	Avg		
Logging Creek, Bridge, Relative Abundance												
	(Belt)	T15N R6E Sec6	RBT	4/12/2005	60	180	5				8	100
			EB	4/12/2005			3				5	60
Lone Willow Creek, Above Pond, Genetics												
	(Smith)	T9N R7E Sec27	WCT	11/10/2005	1000	1314	28	46	188	93	3	77
Lost Creek, Above Falls, Population Estimate/Genetics												
	(Belt)	T16N R9E Sec29	WCT	7/12/2005	100	1307	56	62	233	160	42	116
Mid Camas Creek, Above Barrier, Relative Abundance												
	(Smith)	T9N R3E Sec13	WCT	7/12/2005	600	2028	8				1	14
Middle Fork Little Belt Creek, Section 1, Suppression												
	(Belt)	T12N R9E Sec18	WCT	7/28/2005	113	1940	1	136	136	136	1	2
			EB	7/28/2005	113	1940	14	115	191	137	12	26
Middle Fork Little Belt Creek, Section 2, Suppression												
	(Belt)	T12N R9E Sec18	WCT	8/1/2005	690	8969	90	65	209	141	13	36
			EB	8/1/2005	690	8969	5	130	134	132	1	2
Middle Fork Little Belt Creek, Section 3, Suppression												
	(Belt)	T12N R9E Sec18	WCT	8/10/2005		6327	81	63	203	145		46
			EB	8/10/2005		6327	2	130	149	140		1
Middle Fork Little Belt Creek, Section 4, Suppression												
	(Belt)	T12N R9E Sec18	WCT	8/10/2005		3935	88	75	183	131		81
			EB	8/10/2005		3935	1	103	103	103		1
North Fork Running Wolf Creek, Lower, Population Estimate												
	(Judith)	T14N R10E Sec17	WCT	9/28/2005	100	1088	31	108	178	139	26	86
North Fork Running Wolf Creek, Upper, Population Estimate												
	(Judith)	T14N R10E Sec17	WCT	9/28/2005	100	563	18	111	203	155	12	77

Sampling Site	Drainage	Legal	Species	Date	Length (m)	Seconds Sampled	N	Min	Total Length (mm)		CPUE (100 m)	CPUE (hr.)
									Max	Avg		
O'Brien Creek, Reservoir, Disease	(Belt)	T13N R8E Sec5										
			WCT	5/16/2005	520	2208	35	123	263	190	7	57
Palisades Creek, Upper, Genetics	(Belt)	T13N R8E Sec3										
			WCT	8/17/2005	130	681	15	130	195	159	12	79
Petty Creek, Transfer Section, Relative Abundance	(Sun)	T19N R9E Sec23										
			WCT	8/25/2005	170	2329	16	55	239	149	5	25
Railroad Creek, Above Buffalo Lakes, Relative Abundance	(Two Medicine)	T30N R13E Sec2										
			EB	8/25/2005	70	340	5	76	172	117	7	53
Railroad Creek, Below Buffalo Lakes, Relative Abundance	(Two Medicine)	T30N R13E Sec2										
			EB	8/25/2005	70	935	29	63	235	177	41	112
Ranch Creek, Downstream of Fence, Relative Abundance	(Smith)	T12N R8E Sec32										
			EB	7/5/2005	300	512	8	121	185	155	3	56
Richardson Creek, Exclosure, Relative Abundance	(Smith)	T9N R8E Sec28										
			WCT	7/22/2005		1946	9	74	194	153		17
South Fork Judith River, Bluff Mountain, Population Estimate	(Judith)	T11N R11E Sec4										
			WCT	8/18/2005	175	3300	45	112	283	165	21	40
			RB	8/18/2005	175	3300	121	83	267	151	54	103
South Fork Judith River, Dry Pole, Lengths and Weights	(Judith)	T12N R11E Sec23										
			RBT	8/18/2005			42	99	240	144		
			MTWF	8/18/2005			21	63	187	111		
			EB	8/18/2005			7	62	174	102		
South Fork Judith River, Russian, Population Estimate/Genetics	(Judith)	T11N R11E Sec13										
			WCT	10/27/2005	134	3344	171	74	242	153	109	157
			EB	10/27/2005	134	3344	4	168	205	183	3	4
Stiner Creek, Lower, Genetics	(Judith)	T13N R11E Sec24										
			WCT	9/27/2005		394	37	77	203	143		338

Sampling Site	Drainage	Legal	Species	Date	Length (m)	Seconds Sampled	N	Min	Total Length (mm)		CPUE (100 m)	CPUE (hr.)
									Max	Avg		
Stiner Creek, Upper, Genetics												
	(Judith)	T13N R11E Sec13	WCT	9/27/2005	470	226	35	66	228	143	7	558
Sullivan Creek, Private, Relative Abundance												
	(Upper Missouri)	T18N R3W Sec22	RBT	10/18/2005	312	681	4	86	96	91	1	21
			EB	10/18/2005	312	681	50	85	210	125	16	264
Wolsey Creek, Forest Boundary, Relative Abundance												
	(Smith)	T12N R7E Sec22	EB	9/22/2005	215	2978	46	55	243	127	21	56

WCT = westslope cutthroat trout; EB = brook trout; RBT = Rainbow trout; YCT = Yellowstone cutthroat trout; WCT = Westslope cutthroat trout; MTWF = mountain whitefish

Appendix 6. Results of Region 4 genetics testing results received in 2005. Samples were collected by MFWP and USFS.

Stream	Drainage	Legal	# Fish	Date Collected	Date Reported	Test	Results
Boyd Creek	Arrow	T20N R10E Sec 32	27	10/20/2004	5/9/2005	PINE	100% WCT
Boyd Creek	Arrow	T20N R10E Sec 32	24	10/14/2005	12/26/2005	PINE	100%WCT
Cottonwood Creek	Arrow	T19N R30W Sec 13	25	7/29/2002	12/26/2005	PINE	100%WCT
Carpenter Creek	Belt	T14N R8E Sec 14	26	4/15/2005	6/1/2005	PINE	100% WCT
Chamberlain Creek	Belt	T13N R8E Sec 2	25	8/17/2005	12/26/2005	PINE	100%WCT
Graveyard Gulch	Belt	T14N R7E Sec 36	50	7/21/2005	12/26/2005	PINE	100% WCT
Jefferson Creek	Belt	T13N R8E Sec 6,5,8	29	7/12/2005	12/26/2005	PINE	99% WCT X 1% YCT
Little Belt Creek, N. Fk.	Belt	T19N R8E Sec 12	25	6/18/2002	12/26/2005	PINE	100% WCT
O'Brien Creek	Belt	T13N R8E PB 43	25	6/25/2002	5/9/2005	PINE	100% WCT
Cottonwood Creek, E. Fk.	Judith	T12N R18E Sec 13	25	9/17/2002	5/9/2005	PINE	99.3 % WCT X 0.7% RBT
Hall Creek	Judith	T30N R30W Sec 13	10	7/21/2003	12/26/2005	PINE	<95% WCT**
Stiner Creek, W. Fk.	Judith	T13N R9E Sec13	25	9/27/2005	12/26/2005	PINE	<100% WCT*
Upper Weatherwax Creek	Judith	T12N R9E Sec 5	25	8/5/2003	5/9/2005	PINE	100% WCT
French Creek	Smith	T13N R1E Sec 23	25	9/13/2004	12/26/2005	PINE	92% WCT X 8% RBT
Jumping Creek	Smith	T12N R8E Sec 8	23	7/26/2005	12/26/2005	PINE	100% WCT
Lone Willow Creek	Smith	T9N R7E Sec 28	28	11/10/05	12/26/2005	PINE	100% WCT
Green Gulch, Lower	Teton	T24N R9W Sec 9	25	7/17/2003	12/26/2005	PINE	99% WCT X 1% RBT
Green Gulch, Upper	Teton	T 24N R9W Sec15,16	10	8/15/2005	12/26/2005	PINE	100%WCT
Three Mile Creek	Upper Missouri	T11N R5W Sec 24	25	5/1/2005	12/26/2005	PINE	100%WCT

RBT = Rainbow trout; YCT = Yellowstone cutthroat trout; WCT = Westslope cutthroat trout. * Pure WCT and recent hybrid swarm individuals. ** All individuals hybridized but from different populations.

Appendix 7. Genetic samples taken by MFWP and USFS personnel in 2005.

Stream	Drainage	Legal	# Fish	Date Collected	Test
Carpenter Creek, End of Mine Tailings	Belt	T14N R8E Sec15	26	4/15/05	PINE
Chamberlain Creek, Upper	Belt	T13N R8E Sec2	25	8/17/05	PINE
Graveyard Creek, Above Barrier	Belt	T14N R7E Sec36	50	7/21/05	PINE
Lost Creek, Above Falls	Belt	T16N R9E Sec29	17	7/12/05	Allozyme
Palisades Creek, Upper	Belt	T13N R8E Sec3	15	8/17/05	PINE*
East Fork Big Spring Creek, Middle	Judith	T12N R19E Sec9	100	8/8/05	DNA
South Fork Judith River, Russian	Judith	T11N R11E Sec13	25	10/27/05	PINE
Stiner Creek, Lower	Judith	T13N R11E Sec24	25	9/27/05	PINE*
Stiner Creek, Upper	Judith	T13N R11E Sec13	25	9/27/05	PINE
Boyd Creek, Boundary	Smith	T20N R10E Sec32	24	10/14/05	PINE
Jumping Creek, Section 3	Smith	T12N R8E Sec18	3	7/25/05	PINE
Jumping Creek, Section 4	Smith	T12N R8E Sec8	13	7/26/05	PINE
Jumping Creek, Section 5	Smith	T12N R8E Sec8	7	7/26/05	PINE
Lone Willow Creek, Above Pond	Smith	T9N R7E Sec27	28	11/10/05	PINE

PINE = Paired Interspersed Nuclear Elements. * Will not be run (archived).

Appendix 8. Specific conductance and temperature for streams sampled in 2005. Samples were collected by MFWP and the USFS. Variables were measured once a day but are repeated in the table for each section. Conductivity was not measured by USFS crews because of equipment problems (data blanks).

Stream, Section, Trip Type	Drainage	Date	Cond. (uS)	Temp. C
Cottonwood Creek, Tributary, Suppression	Arrow	9/20/05	-	8
Cottonwood Creek, Section 1, Suppression	Arrow	9/19/05	170	11
Cottonwood Creek, Section 10, Suppression	Arrow	9/21/05	170	8
Cottonwood Creek, Section 11, Suppression	Arrow	9/21/05	170	8
Cottonwood Creek, Section 2, Suppression	Arrow	9/19/05	170	11
Cottonwood Creek, Section 3, Suppression	Arrow	9/20/05	140	11
Cottonwood Creek, Section 4, Suppression	Arrow	9/20/05	140	11
Cottonwood Creek, Section 5, Suppression	Arrow	9/20/05	140	11
Cottonwood Creek, Section 6, Suppression	Arrow	9/20/05	140	11
Cottonwood Creek, Section 7, Suppression	Arrow	9/21/05	170	8
Cottonwood Creek, Section 8, Suppression	Arrow	9/21/05	170	8
Cottonwood Creek, Section 9, Suppression	Arrow	9/21/05	170	8
Big Coulee Creek, Section 1, Suppression	Belt	7/12/05	-	15
Big Coulee Creek, Section 1, Suppression	Belt	7/12/05	-	15
Big Coulee Creek, Section 2, Suppression	Belt	7/20/05	-	12
Big Coulee Creek, Section 2, Suppression	Belt	7/20/05	-	12
Big Coulee Creek, Section 3, Suppression	Belt	7/20/05	-	12
Big Coulee Creek, Section 3, Suppression	Belt	7/20/05	-	12
Big Coulee Creek, Section 4, Suppression	Belt	8/11/05	120	13
Big Coulee Creek, Section 4, Suppression	Belt	8/11/05	120	13
Big Coulee Creek, Section 5, Suppression	Belt	8/15/05	90	7
Big Coulee Creek, Section 5, Suppression	Belt	8/15/05	90	7
Big Coulee Creek, Section 6, Suppression	Belt	8/15/05	-	11
Big Coulee Creek, Section 6, Suppression	Belt	8/15/05	-	11
Big Coulee Creek, Tributary, Suppression	Belt	7/20/05	-	11
Big Coulee Creek, Tributary, Suppression	Belt	7/20/05	-	11
Carpenter Creek, End of Mine Tailings, Genetics	Belt	4/15/05	-	-1
Chamberlain Creek, Lower, Population Estimate	Belt	8/2/05	120	10
Chamberlain Creek, Lower, Population Estimate	Belt	8/2/05	120	10
Chamberlain Creek, Upper, Genetics	Belt	8/17/05	-	8
Chamberlain Creek, Upper, Genetics	Belt	8/17/05	-	8
Chamberlain Creek, Upper, Population Estimate	Belt	8/2/05	-	8
Dry Fork Belt Creek, Lower, Relative Abundance	Belt	10/14/05	-	7
Dry Fork Belt Creek, Tributary, Site A, Relative Abundance	Belt	8/16/05	190	9
Dry Fork Belt Creek, Tributary, Site B, Relative Abundance	Belt	8/16/05	190	9
Gold Run Creek, Lower, Transfer	Belt	9/8/05	150	7
Gold Run Creek, Upper, Relative Abundance	Belt	9/8/05	150	7
Graveyard Creek, Above Barrier, Genetics	Belt	7/21/05	-	9
Logging Creek, Bridge, Relative Abundance	Belt	4/12/05	320	7
Lost Creek, Above Falls, Population Estimate/Genetics	Belt	7/12/05	140	11
Middle Fork Little Belt Creek, Section 1, Suppression	Belt	7/28/05	-	11
Middle Fork Little Belt Creek, Section 2, Suppression	Belt	8/1/05	-	10
Middle Fork Little Belt Creek, Section 3, Suppression	Belt	8/10/05	140	9
Middle Fork Little Belt Creek, Section 4, Suppression	Belt	8/10/05	140	10
O'Brien Creek, Reservoir, Disease	Belt	5/16/05	-	4
Palisades Creek, Upper, Genetics	Belt	8/17/05	30	9

Stream, Section, Trip Type	Drainage	Date	Cond. (uS)	Temp. C
Cottonwood Creek, W. Fork, Tributary, Transfer	Judith	9/7/05	220	10
East Fork Big Spring Creek, Middle, Transfer/Genetics	Judith	8/8/05	290	9
North Fork Running Wolf Creek, Lower, Population Estimate	Judith	9/28/05	300	8
North Fork Running Wolf Creek, Upper, Population Estimate	Judith	9/28/05	300	7
South Fork Judith River, Bluff Mountain, Population Estimate	Judith	8/18/05	160	9
South Fork Judith River, Dry Pole, Relative Abundance	Judith	8/18/05	210	11
South Fork Judith River, Russian, Population Estimate/Genetics	Judith	10/27/05	240	5
Stiner Creek, Lower, Genetics	Judith	9/27/05	280	9
Stiner Creek, Upper, Genetics	Judith	9/27/05	280	9
Boyd Creek, Boundary, Genetics	Smith	10/14/05	210	7
Boyd Creek, Boundary, Genetics	Smith	10/14/05	210	7
Cottonwood Creek, East Fork, Transfer/Population Estimate	Smith	9/14/05	210	6
Daniels Creek, Diversion, Suppression	Smith	9/29/05	90	5
Jumping Creek, Section 1, Suppression	Smith	7/13/05	200	10
Jumping Creek, Section 2, Suppression	Smith	7/14/05	200	8
Jumping Creek, Section 3, Suppression/Genetics	Smith	7/25/05	200	8
Jumping Creek, Section 4, Suppression/Genetics	Smith	7/26/05	180	7
Jumping Creek, Section 5, Suppression/Genetics	Smith	7/26/05	-	7
Jumping Creek, Section 6, Suppression	Smith	7/27/05	150	7
Jumping Creek, Section 7, Suppression	Smith	7/27/05	150	7
Jumping Creek, Section 8, Suppression	Smith	8/1/05	110	9
Lone Willow Creek, Above Pond, Genetics	Smith	11/10/05	70	
Mid Camas Creek, Above Barrier, Relative Abundance	Smith	7/12/05	40	6
Ranch Creek, Downstream of Fence, Relative Abundance	Smith	7/5/05	-	9
Richardson Creek, Exclosure, Relative Abundance	Smith	7/22/05	-	12
Wolsey Creek, Forest Boundary, Relative Abundance	Smith	9/22/05	90	6
Lange Creek, Mid, Habitat Survey	Sun	7/19/05	210	8
Petty Creek, Transfer Section, Relative Abundance	Sun	8/25/05	270	6
Railroad Creek, Above Buffalo Lakes, Relative Abundance	Two Medicine	8/25/05	-	15
Railroad Creek, Below Buffalo Lakes, Relative Abundance	Two Medicine	8/25/05	-	15
Sullivan Creek, Private, Relative Abundance	Upper Missouri	10/18/05	330	11